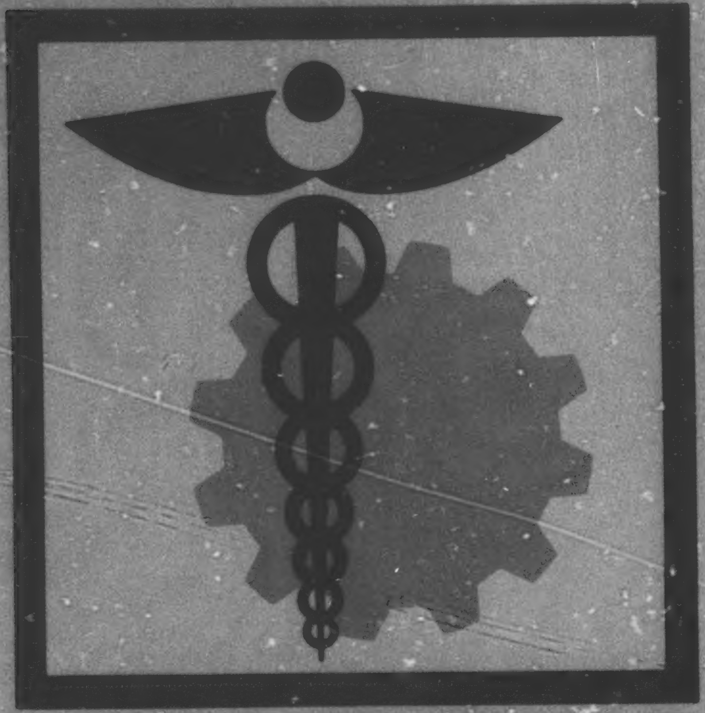
90

READEX FICHE best copy available

CDC

CENTERS FOR DISEASE CONTROL



NIOSH

1990 PROJECTS

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES • Public Health Service • Centers for Disease Control • National Institute for Occupational Safety and Health

E 20.7/27:

NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH

Projects for FY 1990

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Centers for Disease Control
National Institute for Occupational Safety and Health

May 1990

DHHS (NIOSH) Publication No. 90-106

PREFACE

The highlight of program development for NIOSH in 1990 is the significant inclusion of new programs in agriculture and construction into the Institute research agenda. During FY 1990, we expanded our program in the area of agricultural safety and health, recognizing the fact that farmers and their families experience a disproportionate share of injuries and diseases, and five times more fatalities a year than those in other occupations (according to the National Safety Council). We received an $11 million appropriation from Congress specifically for use in this activity. NIOSH is leading and supporting the development of a national system for the prevention of injury and illness among agricultural workers and their family members. This system will incorporate the resources of land grant universities, the Department of Agriculture's extension service, selected rural hospitals, the American Public Health Association, and other components of CDC. In addition, NIOSH will be sponsoring a Surgeon General's conference to build other coalitions and disseminate information to maximize efforts and collaboration.

NIOSH also increased research in the area of construction safety and health during FY 1990, addressing another industry with high risk. The construction industry has the third highest occupational fatality rate. While construction workers constitute only about 5.2 percent of U.S. workers, they rank second highest in number of work-related traumatic injury-related fatalities. We received an appropriation of $1 million from Congress to help in expanding our scientific activity in this important area.

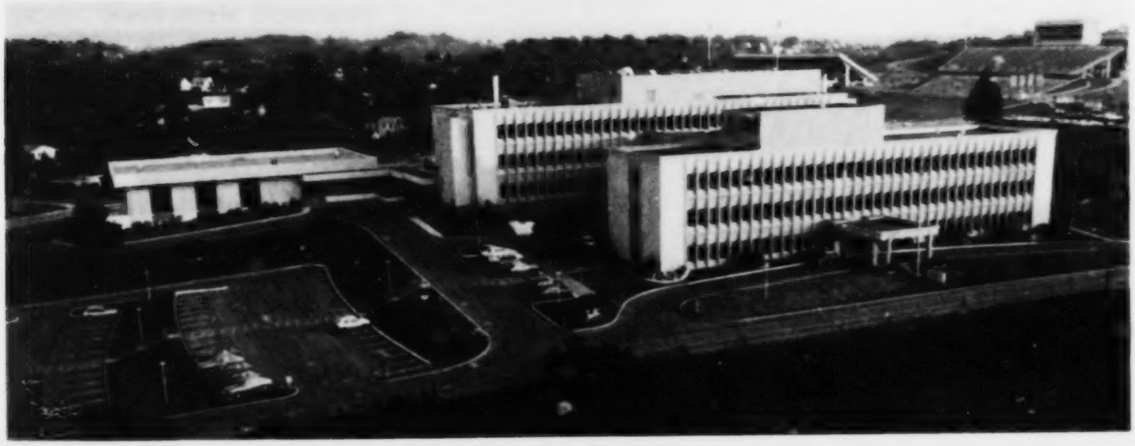
We are proud of the projects contained in this document, and of the staff that has worked untiringly to accomplish the goals of this Institute. These projects reflect an ever increasing emphasis by NIOSH on such problems as indoor air quality, repetitive trauma disorders, reproductive hazards, and stress-related phenomena. It is clear that the demands on NIOSH will continue to increase as work and the workplace change and new problems emerge. As we investigate these and other problems, we inexorably move toward the next century. As we round that bend, occupational safety and health will no doubt continue to be a subject of controversy and concern to business, labor, and academia. The field will continue to evolve; it will continue to evoke mixed reactions from the public; and it will continue to increase in complexity. However, two things will not change. First, primary prevention will continue to be the best solution to the problems of occupational safety and health; and second, NIOSH will lead the nation in exploring new prevention opportunities.

J. Donald Millar, M.D.
Assistant Surgeon General
Director, NIOSH

NIOSH
Taft Center

Robert A. Taft Laboratory, 4676 Columbia Parkway, Cincinnati, Ohio 45226

Alice Hamilton Laboratory, 5555 Ridge Avenue, Cincinnati, Ohio 45213



Appalachian Laboratory for Occupational Safety and Health
944 Chestnut Ridge Road, Morgantown, West Virginia 26505

TABLE OF CONTENTS

PAGE

Preface iii

NIOSH Facilities v

Introduction 1

NIOSH Planning Format 3

NIOSH Organization Chart 4

NIOSH Divisions' Mission Statements 5

Summaries of NIOSH Strategies

Introduction 13

Occupational Lung Diseases 15

Musculoskeletal Injuries 19

Occupational Cancers 23

Severe Occupational Traumatic Injuries 27

Occupational Cardiovascular Diseases 33

Disorders of Reproduction 36

Neurotoxic Disorders 41

Noise-Induced Hearing Loss 46

Dermatological Conditions 49

Psychological Disorders 52

PAGE

NIOSH Projects by Program Areas

Occupational Lung Diseases 59
Musculoskeletal Injuries 81
Occupational Cancers 85
Severe Occupational Traumatic Injuries 96
Occupational Cardiovascular Diseases 102
Disorders of Reproduction 103
Neurotoxic Disorders 106
Noise-Induced Hearing Loss 109
Dermatological Conditions 111
Psychological Disorders 113
Assistance Requests 114
Administration 116
Other 118

NIOSH Projects by Division

Division of Biomedical and Behavioral Science 123
Division of Physical Sciences and Engineering 127
Division of Respiratory Disease Studies 131
Division of Surveillance, Hazard Evaluations, and Field Studies 136
Division of Safety Research 142
Division of Standards Development and Technology Transfer 146
Division of Training and Manpower Development 150

NIOSH PROJECTS FOR FY 1990

INTRODUCTION

The key word for program planning for NIOSH in FY 1990, and the one which is expected to continue to exemplify future planning, is "integrative." In both its external relations and within its own walls, the NIOSH planning process serves to maximize the interchange of ideas among scientists, administrators, and policy makers.

We cannot overemphasize the need to include consideration of occupational safety and health as part of all public health planning and the need to apply public health planning to setting the prevention research agenda for NIOSH.

For example, the Secretary of Health and Human Services has determined a number of initiatives for program planning for the Department during his administration. Those priorities become "de facto" priorities of the component part of the Department. Functionally, the initiatives of the Secretary of Health and Human Services become initiatives of the Public Health Service which become initiatives of the Centers for Disease Control, and, in turn, initiatives for NIOSH.

The exchange of information and priorities is by no means restricted to the Department of Health and Human Services. The Director of NIOSH and the Administration of OSHA highlighted the interdepartmental focus of priorities through the OSHA/NIOSH retreat. This communion will serve as a generator of cooperative programs between the two Departments. Furthermore, continued high quality, meaningful exchanges between and among NIOSH, its Board of Scientific Counselors, the Educational Resource Centers, and the Mine Health Research Advisory Committee cannot help but strengthen the planning process. Recommendations from these groups are communicated with specific guidance for planning by the Director of the Institute.

An important example of the integrative effect of initiatives is found in the focus of the Secretary on children and youth. That theme has been expanded upon by the Assistant Secretary for Health, and is among the three primary focal points of the Director of CDC. It is re-emphasized in planning among the CDC programs. This has affected NIOSH through its concern and emphasis on child labor. It is an important issue noticed and pursued by the Institute but heightened in its acuity because of the Secretary's initiatives.

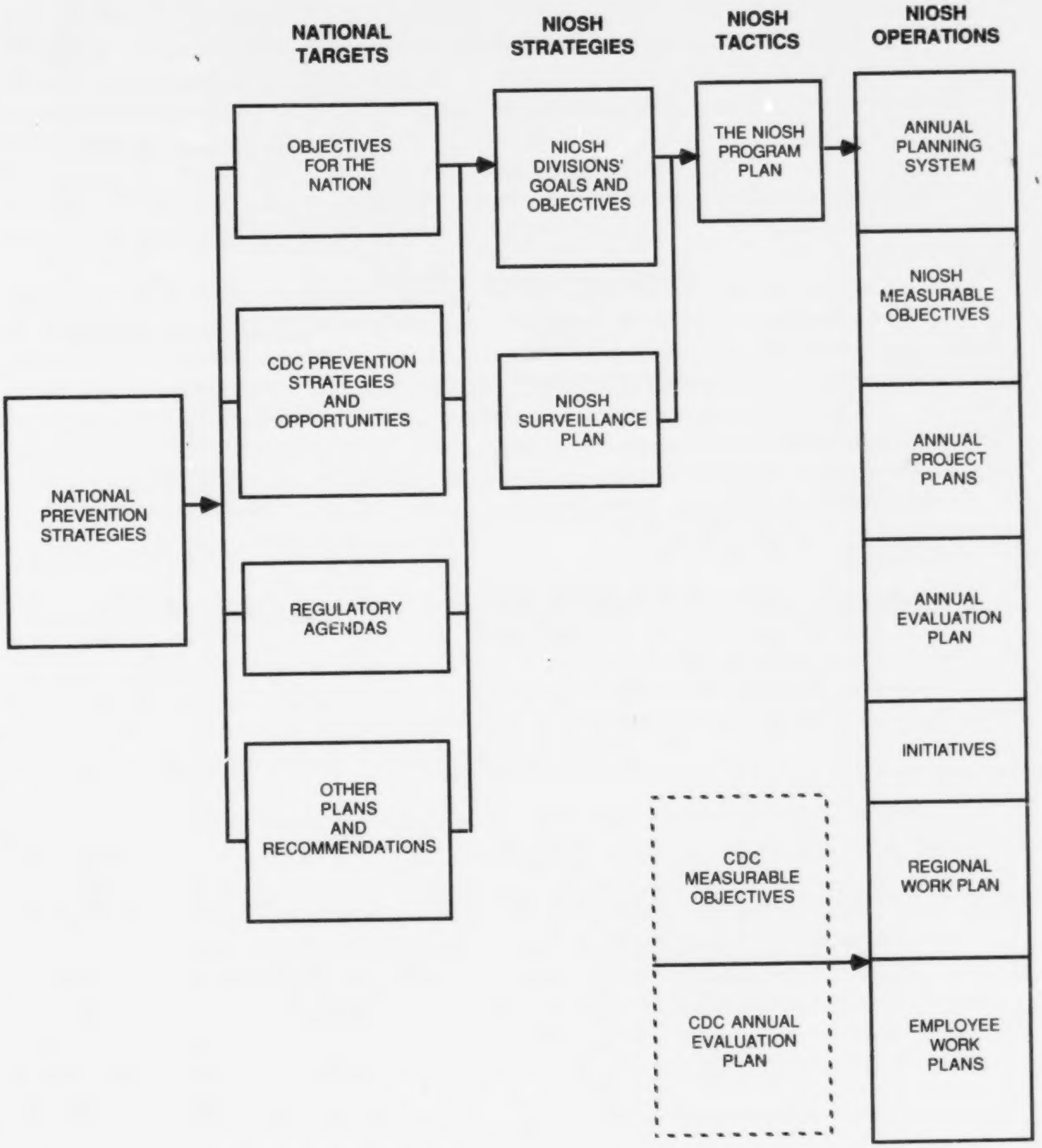
That same theme of integration runs through the current CDC examination and development of infrastructure. A current theme of the Centers is the strengthening of public health in the United States. In response to the Institute of Medicine report, "The Future of Public Health," a CDC task force has developed a strategic approach to addressing the nation's public health needs in "assessment policy development" and "assurance." As a representative "Center," the Institute shares in that development. As a result of those task group meetings, negotiations, programs, and structural descriptions, occupational safety and health has become a viable component of every plan to strengthen public health in the United States.

Additionally, many of the same people who have served as representatives on the plan to strengthen public health in the United States have also served in the development process for the Year 2000 Objectives and the development of model standards for the operation of State Health Departments. That continuing sharing, negotiation, and deliberation serve greatly to heighten cross program fertilization which will yield a more knowledgeable and comprehensive public health plan.

The integrative and comprehensive approach is mirrored in the NIOSH Divisions' approach to program planning. The Institute is gravitating away from individual investigator-initiated projects. More and more, the Institute is using the working group or task force method of program planning. The emphasis here is on the word "program." Member working groups have been put together to respond to the need to develop programs for Musculoskeletal Disorders, Agriculture, Construction, Occupational Lung Diseases, Psychological Disorders, and Health Promotion. These working groups are experts from the NIOSH Divisions. They meet frequently to review intramural and extramural research results, define the state-of-the-art technology, describe knowledge gaps, and define priorities for the resolution of those gaps. The projects contained in this document largely reflect the group efforts or the efforts of those task group members. This approach also has the benefit of interdivisional collaboration on needed equipment and required expertise to manage forthcoming programs.

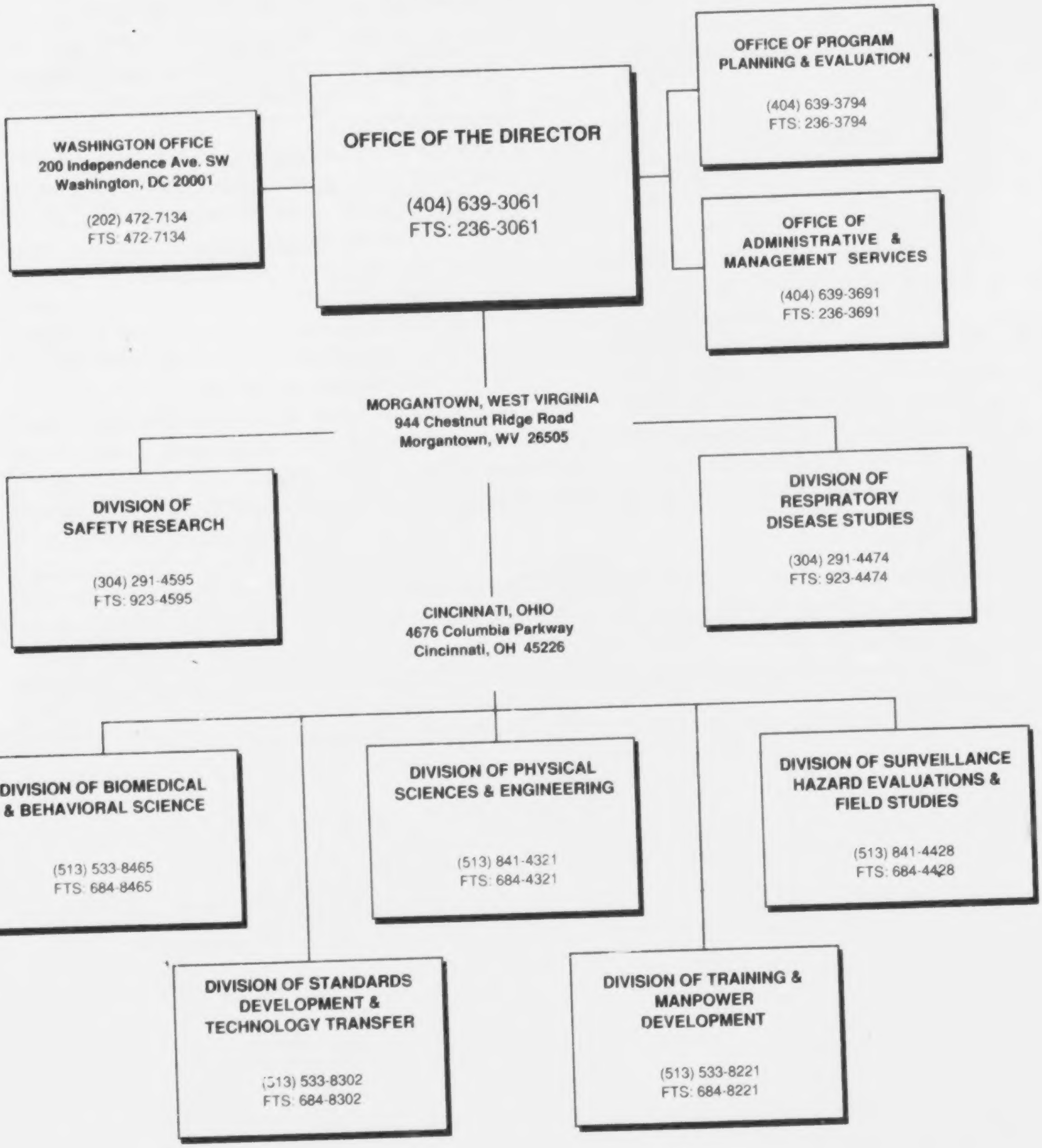
Beyond the creation of ad hoc committees or task groups to plan in the area of immediate need (such as a response to the availability of supplemental funds in a specific area) the task groups have been noticeably important on an ongoing basis to plan the yearly programs of the Divisions. We expect that the continued integration of planning at every level will in the future produce an Institute program which is highly responsive to public health needs while at the same time is a direct exemplification of the priorities of the Institute.

NIOSH PLANNING FORMAT
FY 1990


NATIONAL TARGETS
NIOSH STRATEGIES
NIOSH TACTICS
NIOSH OPERATIONS
NATIONAL PREVENTION STRATEGIES
OBJECTIVES FOR THE NATION
CDC PREVENTION STRATEGIES AND OPPORTUNITIES
REGULATORY AGENDAS
OTHER PLANS AND RECOMMENDATIONS
NIOSH DIVISIONS' GOALS AND OBJECTIVES
NIOSH SURVEILLANCE PLAN
THE NIOSH PROGRAM PLAN
ANNUAL PLANNING SYSTEM
NIOSH MEASURABLE OBJECTIVES
ANNUAL PROJECT PLANS
ANNUAL EVALUATION PLAN
INITIATIVES
REGIONAL WORK PLAN
EMPLOYEE WORK PLANS
CDC MEASURABLE OBJECTIVES
CDC ANNUAL EVALUATION PLAN

THE NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH

1600 Clifton Road
Atlanta, GA 30333



WASHINGTON OFFICE
200 Independence Ave. SW
Washington, DC 20001
(202) 472-7134
FTS: 472-7134

OFFICE OF THE DIRECTOR
(404) 639-3061
FTS: 236-3061

OFFICE OF PROGRAM PLANNING & EVALUATION
(404) 639-3794
FTS: 236-3794

OFFICE OF ADMINISTRATIVE & MANAGEMENT SERVICES
(404) 639-3691
FTS: 236-3691

MORGANTOWN, WEST VIRGINIA
944 Chestnut Ridge Road
Morgantown, WV 26505

DIVISION OF SAFETY RESEARCH
(304) 291-4595
FTS: 923-4595

DIVISION OF RESPIRATORY DISEASE STUDIES
(304) 291-4474
FTS: 923-4474

CINCINNATI, OHIO
4676 Columbia Parkway
Cincinnati, OH 45226

DIVISION OF BIOMEDICAL & BEHAVIORAL SCIENCE
(513) 533-8465
FTS: 684-8465

DIVISION OF PHYSICAL SCIENCES & ENGINEERING
(513) 841-4321
FTS: 684-4321

DIVISION OF SURVEILLANCE HAZARD EVALUATIONS & FIELD STUDIES
(513) 841-4428
FTS: 684-4428

DIVISION OF STANDARDS DEVELOPMENT & TECHNOLOGY TRANSFER
(513) 533-8302
FTS: 684-8302

DIVISION OF TRAINING & MANPOWER DEVELOPMENT
(513) 533-8221
FTS: 684-8221

JANUARY 1990

DIVISION OF BIOMEDICAL AND BEHAVIORAL SCIENCE

The Division of Biomedical and Behavioral Science (DBBS) plans and conducts laboratory research and worksite studies in the disciplines of toxicology, behavioral science, ergonomics, and physical agents to determine safety and health consequences of occupational exposures. DBBS investigates health and safety problems resulting from new industrial technologies, and develops biological monitoring and diagnostic procedures to improve the health, safety performance, functional capacity, and life expectancy of workers. Consultation and research data necessary to develop criteria for workplace exposure standards are furnished as part of these activities.

DBBS investigates the psychological (e.g., stress), neurobehavioral, biomechanical, and physiological effects of hazardous working conditions, resulting from exposure to chemical and physical agents as well as psychological and biomechanical stressors, found in the work environment. The division research assesses physical and biomechanical work capacity, neurobehavioral status, and psychological tolerance to stressful occupational conditions, as influenced by demographic, experiential, health and environmental factors. Interventions and control procedures are developed and evaluated for their efficacy in addressing job stress and strain, safety performance, and health outcomes (e.g., musculoskeletal disorders).

DBBS conducts research on hazards from physical agents such as noise, vibration, and non-ionizing radiation in the workplace. Studies seek to delineate mechanisms of injury and exposure factors that are of consequence to the health and well-being of the work force. Investigations, including instrumentation and methods development, for characterizing and relating exposure factors to biological and performance changes in animal and human populations are undertaken.

The DBBS toxicology research addresses dose-response relationships, mechanisms of toxicity and development of methods to evaluate the effects of exposure to toxic agents, psychological and biomechanical stressors. Approaches include applications of cellular biology, biochemistry, immunochemistry, pharmacokinetics, and neurophysiology in order to achieve a clearer understanding of the disease process, to determine exposures in occupationally-relevant populations, and ultimately to ascertain an estimate of risk associated with defined workplace exposures. Through laboratory analysis of biological samples from animals exposed experimentally and humans exposed occupationally to workplace hazards, DBBS provides clinical and biochemical consultations for ascertaining the effects and extent of exposures.

DBBS is located at the Robert A. Taft Laboratory, 4676 Columbia Parkway, Cincinnati, Ohio 45226. The Division Director is Janet C. Haartz, Ph.D., telephone (513) 533-8465, FTS 684-8465.

DIVISION OF PHYSICAL SCIENCES AND ENGINEERING

The Division of Physical Sciences and Engineering (DPSE) conducts worksite and laboratory research to develop procedures and equipment for the control and measurement of occupational safety and health hazards. DPSE also provides assistance to the industrial hygiene community in operating a quality control reference program for industrial hygiene laboratories.

DPSE conducts a control technology assessment and research program to prevent occupational disease and injury before they occur by assisting employers, including smaller businesses, in better design and operation of the workplace. This work involves identification and evaluation of effective engineering controls and work practices used in a variety of processes and industries. The division promotes the transfer and widespread application of these preventive engineering control measures. It also provides engineering expertise in formulating effective workplace standards.

DPSE conducts research to establish performance requirements for direct reading, area, and personal instrumentation used in the evaluation and prevention of exposures to hazardous levels of chemical and physical agents. The division also provides consultation for the development of criteria and standards on monitoring strategies, instrumentation, and controls.

DPSE conducts research to develop and improve methods for analysis of toxic substances found in the workplace. Also, DPSE provides analytical chemistry support to the Institute's laboratory research and field investigation programs, including routine measurement of samples by established methods, special measurement of complex samples, and short-term development of methods. This analytical research and support involves the use of state-of-the-art analytical instrumentation such as high resolution gas chromatography, gas chromatography-mass spectrometry, high performance liquid and ion chromatography, and Fourier Transform Infrared Spectroscopy (FTIR). In addition, DPSE provides consultation in analytical chemistry to all elements of NIOSH, and to other government agencies, recommending appropriate sampling and analytical methods.

Quality of the nation's workplace environment analytical data is assessed through the Proficiency Analytical Testing (PAT) Program. DPSE (working with the American Industrial Hygiene Association) determines the analytical competence of participating laboratories, and assists the laboratories in improving analytical performance. The division also encourages and supports development and promulgation of national guidelines for accreditation of industrial hygiene laboratory facilities; selects and develops standard reference materials for use in the measurement of industrial hygiene hazards, and provides for quality assurance in the analysis of the Institute's laboratory and field programs and contract laboratories.

The Division of Physical Sciences and Engineering is located at the Alice Hamilton Laboratory, 5555 Ridge Avenue, Cincinnati, Ohio 45213. The Division Director is Philip J. Bierbaum, telephone (513) 841-4321, FTS 684-4321.

DIVISION OF RESPIRATORY DISEASE STUDIES

The Division of Respiratory Disease Studies (DRDS) is the focal point for clinical, epidemiological, environmental, and laboratory research and service related to prevention of occupational respiratory diseases.

To identify and quantify the effects of occupational exposures, to elucidate differential host susceptibilities, and to develop methods for the early detection and prevention of occupational respiratory diseases, DRDS conducts basic and applied research in the areas of biochemistry, physiology, immunology, pathology, microbiology, pharmacology, and aerosol physics. Surveillance is conducted to determine trends in prevalence and to evaluate progress in prevention of occupational lung diseases. Clinical studies of workers are performed to evaluate respiratory effects of occupational environments, to clarify the mechanisms of human responses, and to develop and refine techniques for occupational respiratory disease investigations. Industrial hygiene methods are used to quantify exposures to hazardous substances. Epidemiological studies of worker populations are conducted to assess risk of disease associated with a variety of exposures at mines, mills, and other industrial, construction, and agricultural workplaces where occupational respiratory diseases occur. Industrial hygiene, medical, laboratory, and epidemiological techniques are also employed by industrial hygienists, physicians, nurses, medical technicians, and epidemiologists who, through the division's Respiratory Disease Hazard Evaluation Program, evaluate reported problems occurring at specific work sites.

DRDS coordinates and processes medical, radiological, pathological, and autopsy examinations mandated under the *Federal Mine Safety and Health Act of 1977*, and operates a certification program for medical facilities, employer programs, and physicians who participate in the examination programs. DRDS also arranges examinations for eligible employees who work at locations not having an approved employer program.

Training and experience in epidemiological, clinical, and laboratory-based research related to occupational respiratory diseases is provided through DRDS-sponsored positions in the Centers for Disease Control Epidemic Intelligence Service, the NIOSH pulmonary medicine fellowship program, and the National Research Council's Resident Research Associateships program, as well as through DRDS elective experiences for occupational medicine residents and West Virginia University graduate students.

DRDS is located at 944 Chestnut Ridge Road, Morgantown, West Virginia 26505-2888. The Division Director is Gregory R. Wagner, M.D., telephone (304) 291-4474, FTS 923-4474.

DIVISION OF SAFETY RESEARCH

The Division of Safety Research (DSR) serves as the focal point for the Institute's occupational injury research and prevention program. The division also operates the Federal respirator and coal mine dust personal sampler unit (CMDPSU) testing and certification programs, and conducts research to provide criteria for improving respirators and other personal protective equipment and devices.

Occupational Injury Research. DSR collects, analyzes, interprets, and summarizes occupational injury and fatality data to identify worker populations at high risk of occupational injury, and monitor occupational injury trends. DSR investigates selected traumatic injuries and fatalities to identify potential causal factors and prevention strategies. Laboratory and field investigations are conducted to identify and evaluate existing prevention techniques and technology and develop and evaluate new prevention techniques. As worker protection strategies are formulated, DSR conducts applied field intervention trials and demonstration projects to determine their technical efficacy and practical applicability. DSR develops technical criteria to support recommendations for occupational safety standards and develops, implements, and evaluates the impact of risk communication efforts. DSR also provides technical assistance in solving safety problems which require expertise in industrial and system safety engineering, ergonomics, industrial hygiene, and related disciplines.

Respirator and CMDPSU Certification and Research. DSR evaluates, certifies, and maintains official records on respirators and CMDPSU as required by the Federal Mine Safety and Health Amendments Act of 1977, and the Occupational Safety and Health Act of 1970. DSR continually reviews performance requirements, standards, and guidelines for certification. The Division also develops new performance requirements and standards for respirators. To ensure that respirators continue to meet regulatory requirements, DSR conducts performance audits of certified respirators, and quality assurance audits of respirator manufacturing plants. Additionally, DSR investigates field problems associated with NIOSH-certified equipment; provides technical assistance to users on the selection, use, maintenance, and operation of certified equipment; conducts research to characterize respirator performance in the laboratory, under simulated worksite conditions, and at worksite settings; conducts research to evaluate human physiological response to respirator and protective ensemble (i.e., protective clothing) wear under various conditions; and identifies and recommends needed research to the occupational safety and health community.

The Division of Safety Research is located at the Appalachian Laboratories for Occupational Safety and Health (ALOSH), 944 Chestnut Ridge Road, Morgantown, West Virginia 26505-2888. The Division Director is Thomas R. Bender, M.D., M.P.H., telephone (304) 291-4595, FTS 923-4595.

DIVISION OF STANDARDS DEVELOPMENT AND TECHNOLOGY TRANSFER

The Division of Standards Development and Technology Transfer (DSDTT) develops, from existing scientific and technical information, documents containing (a) criteria for recommended occupational safety and health standards, and (b) technical and scientific information relevant to a variety of occupational safety and health issues. In cooperation with the U.S. Department of Labor, DSDTT coordinates NIOSH testimony at the Department of Labor hearings on proposed standards to support scientific and technical considerations, and prepares and annually revises the legislatively mandated toxic substances list. DSDTT manages a clearinghouse for receiving, storing, retrieving, and disseminating technical information on occupational safety and health.

DSDTT compiles and analyzes the results of research and investigations pertaining to selected occupational safety and health hazards for the purpose of preparing recommended standards. These standards include environmental limits, requirements for medical examinations for workers, labeling, personal protective equipment and clothing, employee notification of hazards, safe work practices, sanitation, monitoring, and record keeping. The division prepares special occupational hazard reviews and risk assessments of potential workplace hazards where new evidence of a particular hazard is received, and prepares recommended emergency temporary standards as appropriate.

DSDTT identifies information on worker exposure, chemical hazard severity, and other data through profile development, and maintains a system for determining the status of projects in other federal agencies and the private sector for quick response in identification of potential workplace hazards. The division establishes liaison with government and non-government sources to obtain technical data, and develops and maintains the NIOSH computer-based technical information system and other computer-oriented information resources.

The division identifies, in priority order, those substances, industries, and occupations which pose an unacceptable safety and health hazard, and prepares priority lists of substances, processes, industries, etc., for which document development and Institute research should be developed or revised. DSDTT also analyzes information on the exposure of workers to safety and health hazards, and assesses the adequacy of studies, research, and data collection activities to provide the basic information needed for decisions on quantitative risk estimation, document development, priorities establishment, and other actions coming from essential information.

DSDTT is located at the Robert A. Taft Laboratories, 4676 Columbia Parkway, Cincinnati, Ohio 45226. The Division Director is Richard W. Niemeier, Ph.D., telephone (513) 533-8302, FTS 684-8302.

DIVISION OF SURVEILLANCE, HAZARD EVALUATIONS, AND FIELD STUDIES

The Division of Surveillance, Hazard Evaluations, and Field Studies (DSHEFS) conducts surveillance of the nation's work force and workplaces to assess the magnitude and extent of job-related illnesses, exposures, and hazardous agents. DSHEFS conducts legislatively mandated health hazard evaluations at the request of unions, employers or employees. Additionally, DSHEFS conducts mandated industrywide epidemiological research programs including longitudinal record studies and clinical/environmental field studies and surveys. DSHEFS also provides technical assistance on occupational safety and health problems to other federal agencies, State and local agencies, and other technical groups.

Surveillance efforts are designed for the early detection and continuous assessment of the magnitude and extent of occupational illnesses, disabilities, deaths, and exposures to hazardous agents, using new and existing data sources from federal, State, and local agencies, labor, industry, tumor registries, physicians, and medical centers. DSHEFS also conducts evaluation and validation studies of occupational illness reporting systems with the intent of improving methods for measuring the magnitude of the national occupational health problem.

Health hazard evaluations and industrywide studies programs (1) provide a technical service to the occupational safety and health community, (2) identify the occupational causes of disease in the working population and their offspring, and determine the incidence and prevalence of acute and chronic effects of work-related exposures to toxic substances, (3) provide information used in standards development for the control of occupational health hazards, and (4) provide information on extent of exposure to agents of interest in the workplace.

DSHEFS is located at the Alice Hamilton Laboratory, 5555 Ridge Avenue, Cincinnati, Ohio 45213. The Division Director is Lawrence J. Fine, M.D., telephone (513) 841-4428, FTS 684-4428.

DIVISION OF TRAINING AND MANPOWER DEVELOPMENT

The Division of Training and Manpower Development (DTMD) implements Section 21 of the Occupational Safety and Health Act of 1970 which mandates the training and education functions. The educational resource development program assesses manpower needs for OSH practitioners and researchers on a nationwide basis. DTMD develops programs to increase the numbers and competence of the OSH professional and paraprofessional work force. To help meet the demand, DTMD administers a major training grant program to foster the development of academically based training programs for occupational physicians, occupational health nurses, industrial hygienists, toxicologists, epidemiologists, and safety professionals. DTMD also develops specific criteria for the selection of qualified organizations to conduct research training, graduate degree and continuing education, and outreach programs to expand the network of knowledgeable professionals in occupational safety and health.

The curriculum development program designs and produces course packages and other training materials for Institute-sponsored training programs, including those presented by in-house faculty as well as those conducted by universities and other outside training organizations. The continuing education program provides short term technical training courses, including seminars, independent study packages, and specialized workshops to train-the-trainer to federal, State and local government; private industry; labor unions; and other organizations in the OSH field.

DTMD special emphasis projects have targeted primary care physicians (Project EPOCH), engineers (Project SHAPE), managers (Project Minerva), vocational education/and science teachers to include occupational safety and health knowledge in their formal program of study. The Division establishes a collaborating relationship with the many professional societies and accrediting bodies to formalize the process of long-term commitment through professional networking.

DTMD is located at the Robert A. Taft Laboratories, 4676 Columbia Parkway, Cincinnati, Ohio 45226. The Division Director is Thomas C. Purcell, Ph.D., telephone (513) 533-8221, FTS 684-8221.

SUMMARIES

OF

NATIONAL PREVENTION STRATEGIES

Occupational Lung Diseases

Musculoskeletal Injuries

Occupational Cancers

Severe Occupational Traumatic Injuries

Occupational Cardiovascular Diseases

Disorders of Reproduction

Neurotoxic Disorders

Noise-Induced Hearing Loss

Dermatological Conditions

Psychological Disorders

SUMMARIES OF NATIONAL PREVENTION STRATEGIES

INTRODUCTION

In 1983, the National Institute for Occupational Safety and Health (NIOSH) published a suggested list of leading work-related diseases and injuries. Scientists at the Institute had developed this list as a guide for setting priorities and allocating resources within the Institute, and as a focal point for discussion among occupational health professionals throughout the country. NIOSH then undertook the preparation of proposed national strategies for the prevention of each condition on the list.

In May 1985, NIOSH and the Association of Schools of Public Health (ASPH) co-sponsored a national symposium for the in-depth evaluation of proposed strategies for the first five conditions: occupational lung diseases, musculoskeletal injuries, occupational cancers, severe occupational traumatic injuries, and occupational cardiovascular diseases. Under the direction of 51 expert panelists, the more than 450 symposium participants--representing academia, management, organized labor, professional associations, and voluntary organizations--discussed, revised, elaborated, and further developed the strategies.

In October of 1986, the second NIOSH National Symposium on the Prevention of Leading Work-Related Diseases and Injuries was convened. This symposium presented and modified the second five of the "ten leading work-related diseases and injuries." Like the first, it was a resounding success. These symposia provided an opportunity for discussion, modification, and input to the strategies that were developed by NIOSH. We now have the first "national" plan to eliminate, by preventing, negative health effects of work. These strategies generally include four parts: definitions, description of the nature of the problem, depiction of the preventive measures that can now be taken, and depiction of the knowledge required to move forward. The specific content of these strategies is diverse, reflecting the many professionals whose ideas are there; however, the attempt to emphasize "basics" undergirds each.

At these symposia, a new national vision was introduced--a vision that unsafe working conditions are no longer tolerable and that clear and understandable steps can be taken to prevent the leading occupational diseases and injuries. Throughout these National Prevention Strategies, common themes emerge: (1) An important component in each prevention strategy is surveillance. Surveillance is needed to accurately estimate the incidence of the disorder, to identify the population at risk, to direct the most effective preventive measures where they are needed, and to measure the impact of intervention. (2) The strategies also focus on scientific research. Research is needed to develop the specific knowledge and understanding on which prevention depends.

(3) Another integral component is training. Effective communication through education, technology transfer, the dissemination of information, and training is required to reach the full potential of prevention. Well-trained workers, knowledgeable managers, and fully informed occupational safety and health professionals are essential elements in any prevention program. (4) Finally, the strategies emphasize the importance of applying and adapting existing knowledge to prevent occupational diseases and injuries. Research results are only effective in preventing such conditions if they are applied in the workplace. Useful information is already available, and ways must be found to target and apply it where it will do the most good.

Out of the symposia and the subsequent voluminous exchange between NIOSH and the participants came the National Strategies for the Prevention of Work-Related Diseases and Injuries. They have been published and widely disseminated, and are designed to serve as working documents to guide NIOSH, other agencies, business, labor, and academia to work more cohesively toward providing for safe and healthful working conditions.

OCCUPATIONAL LUNG DISEASES

The lung is both a target organ and a portal of entry for toxic substances. The likelihood of toxic exposure to the lung can be high; for example, an estimated 1.2 million U.S. workers are potentially exposed each year to silica dust alone. Although occupational lung disease is caused by the inhalation of toxic substances in the work environment, the association between occupational exposure and lung disease is not always apparent or simple. The occurrence of multiple or mixed exposures, the non-specificity of symptoms, the relatively long latency for these diseases, and the independent or synergistic effects of cigarette smoking may all confound the recognition of occupational factors in lung disease.

Classifying lung disease by the type of occupational exposure that leads to it permits rapid identification of toxicants and the application of available control technology. Major types of exposure include inorganic dusts (silica, asbestos, coal dust), organic and metallic dusts (cotton, grain, metallic salts, antibiotics), gases and fumes (nitrogen, methane, ammonia, phosgene), viable aerosols (bacteria, viruses), and respiratory carcinogens (arsenic, chromium, coke oven emissions). Four occupational lung diseases that are deemed preventable are asbestosis (caused by exposure to asbestos), byssinosis (cotton dust), silicosis (silica), and coal workers' pneumoconiosis (coal dust). These have been targeted in the 1990 objectives of the U.S. Public Health Service for elimination of new cases among workers newly exposed after 1985 (USDHHS, 1980). These diseases and their causative agents will be cited as examples in the following prevention strategy. Methods for their control may be adapted for most other occupational lung diseases.

Disease descriptions

The asbestos-related diseases include nonmalignant fibrogenic effects on the lung parenchyma and pleural plaques as well as malignant neoplasms of the lung and the serosal linings of the chest and abdomen (mesothelioma). The latency is ≥15 years for asbestosis and 20-40 years for malignancies. Synergistic effects of smoking increase the risk of lung cancer.

Byssinosis includes both acute (reversible) and chronic lung disease. The effects may be due to specific causal agents in the dust of certain varieties of cotton or other vegetable fibers.

Silicosis may be acute or chronic (nodular pulmonary fibrosis) and affects workers in foundries, stone quarries, sand and gravel operations, and mines. Latency is long, and disease progresses even after exposure ends.

Coal workers' pneumoconiosis (CWP) shows a clear dose-response relationship to coal-dust exposure. Enforcing lower dust standards in both Great Britain and the United States has reduced the incidence of this disease. When workers with early, simple CWP are identified, serious disabling disease may be prevented by transferring the workers to lower-dust environments.

Implementing what we know

Surveillance: Environmental surveillance of hazardous agents is needed to identify occupations, industries, and worksites with potential for high incidence of occupational respiratory disease (e.g., asbestos-removal operations, industries using cottons with high levels of endotoxins, and ground silica). Current environmental surveillance should continue, and activities for prevention should be targeted to the locations identified. Disease surveillance of workers is also important and can help determine pre-existing conditions (reduced ventilatory function), early development of disease (simple CWP), or hypersusceptibility to given agents (acute reactions to cotton dusts). Interventions, such as reducing further exposure, should focus on the affected workers.

Substitution: Hazardous agents can often be replaced by less hazardous and noncarcinogenic substitutes. Cottons that cause less acute responses in humans (e.g., high-grades, blends, or washed cottons and synthetic substitutes) can be used; and silica can be banned as an abrasive blasting material, with nontoxic materials substituted.

Control: Technology is already available to control many hazardous exposures through engineering design and automation, ventilation, and isolation. Although silica exposures above legal limits are still occurring, control can nearly always be achieved through engineering or substitution once exposure is recognized. Personal protective devices (e.g., respirators), however, should not be considered primary protection mechanisms because they rely on human intervention and may not provide the level of protection determined in the laboratory.

Incentives and Regulation: Economic incentives, such as lower insurance premiums, will often stimulate the adoption of control measures. More often, regulatory enforcement is needed for effective control of exposure levels. The permissible exposure limit for asbestos should be reduced, as recommended by NIOSH, to the lowest measurable level--100,000 fibers/m^3, and OSHA should require a dust-control and monitoring plan before any work involving asbestos exposure begins. Present silica standards range from 33 ug/m^3 to 98 ug/m^3 and should be unified. The 1970 coal dust standard (2 mg/m^3 with medical monitoring) appears to reduce the incidence of CWP, and the authority of federal inspectors to shut down coal mines where hazards are severe may help to enforce compliance.

Education: Both the Mine Safety and Health Act and the Occupational Safety and Health Act place responsibility on employers to provide safe, healthful workplaces. Workers should be told about hazardous exposures and available control measures, and then workers and managers should cooperate to control exposures through technology transfer, changes in work practices, implementation goals, and periodic assessment. Technical information already available should be used to increase awareness of work-related lung problems and to produce clear, easily understood texts on control for small as well as large-scale operations.

Educational programs targeted to engineers, managers, occupational health professionals (including primary care physicians), and workers should cover the nature of the work environment and how to assess and control work exposures. State and local health departments can provide expertise and leadership for these programs. Although workers' compensation provides financial relief after exposures occur, awareness is needed before exposure through adequate warnings and product labeling.

Tobacco smoking may have additive and/or synergistic effects on the development of lung disease, both for smokers and for others exposed to tobacco smoke. Labor management policies are needed for smoking in the workplace, and appropriate State legislation on smoking in public places could also be used to limit workplace smoking.

What knowledge do we need?

Research: Several research needs have been suggested. Substitute agents should be tested to determine their toxicity before they are used. Studies should determine whether serious effects result from episodic, low-level exposures to pulmonary irritants and whether long-term effects follow acute responses. Workers exposed to asbestos should be studied to determine dose-response relationships, the effects of intermittent and short-term high exposures, the pathogenicity of various asbestos fibers (e.g., "short" fibers) and asbestos substitutes, and the significance of pleural changes and pleural plaques. Studies should also identify the fiber-release potential of in-place asbestos materials, the relative risks and benefits of asbestos removal, and the effectiveness of removal practices. The relationship in cotton workers of acute responses and chronic respiratory disease can be clarified if normal annual decrements in lung function are determined. Research on exposure to silica should include dose-response relationships, particularly at low levels and for mixed dusts containing silica. Analysis of current MSHA and OSHA environmental data on exposure to silica will help identify hazardous industries, locations, and specific processes. The carcinogenic properties of quartz also need study. The problem of hypersensitivity pneumonitis and the relationship between smoking and diffuse lung fibrosis should be investigated. Host risk factors (e.g., smoking and atopy) must also be examined.

Hazard Detection and Disease Diagnosis: Better methods are needed to measure airborne concentrations of hazardous substances and to enhance environmental surveillance, especially for mixed dusts in underground and surface coal mines. More sensitive techniques must be developed for screening workers to recognize early signs of disease (particularly at the cellular level) and to predict susceptibility to lung diseases. An operational definition of silicosis will help standardize diagnosis and reporting.

Incentives and Regulation: Incentives and educational materials should be available to encourage the efficient use of strategies for controlling exposures. The mandate for medical surveillance in the current Cotton Dust Standard should be reassessed to determine whether new recommendations from NIOSH are needed. Results of long-term studies on the adverse health effects of dust exposure (including nonpneumoconiotic lung diseases, such as bronchitis and emphysema) will help in setting total dust regulations for both coal mining and general industry. Data on the relative causality of exposures to carcinogens and on exposure-response measurements will help in setting effective exposure standards.

Control: When the exact etiologic agent(s) of byssinosis are identified, their removal by cultivating or processing cotton can be facilitated, and effective controls and exposure standards can be developed. Changes in mining techniques necessitate that mine planning and the design and installation of new equipment be based on forecasting and predictive techniques, such as predictive models. For example, the increased use of longwall mining, the continuous use of mining equipment, and the increased rates at which coal is broken all require new approaches to control. The characteristics of respirable dust will need to be correlated with coal seam and mining methods; and new technology implement intermittent dust sources.

Summary

This prevention strategy cannot succeed on the basis of any one element alone; all must be addressed to prevent occupational lung diseases. Thus, although problem areas can be identified by environmental and medical surveillance, follow-up and elimination or reduction of exposure are also needed. Surveillance must be coupled with exposure control (e.g., work practices, automation, ventilation, incentive systems, strict enforcement of exposure standards) and other important elements described here. Health promotion and development of workplace smoking policies, while not always directly related to occupational exposures, are additional important elements.

MUSCULOSKELETAL INJURIES

Musculoskeletal injuries include both acute and chronic injury to the muscles, tendons, ligaments, nerves, joints, bones, and supporting vasculature. These injuries may be sprains, strains, inflammations, irritations, and dislocations. In the medical literature, this broad class of physical symptoms or complaints is collectively referred to as wear-and-tear disorders, overuse injuries, osteoarthrosis, degenerative joint diseases, chronic microtraumas, and cumulative trauma disorders.

To find preventive measures for these injuries, it is helpful to identify contributing elements and to look at these elements in the four main categories outlined by the Canadian Health Fields Model.

Environmental Hazards: A workplace hazard to the musculoskeletal system is called a *traumatogen*, or a source of biomechanical stress that results when job demands exceed the worker's strength or endurance.

Human Biologic Factors: Innate qualities, such as physical size, strength, range of motion, work endurance, and the integrity of the musculoskeletal system, influence a worker's ability to perform a job safely.

Behavioral or Lifestyle Factors: Such factors as insufficient sleep or recovery from exertion, job dissatisfaction, obesity or lack of adequate physical fitness, unhealthy diet, and substance abuse may increase a worker's risk of musculoskeletal strain or injury.

Inadequacies in Health Care Systems: A lack of medical knowledge or of appropriate training in the etiology, diagnosis, and treatment of musculoskeletal problems may result in inadequate health care.

Much remains to be learned about the causes of work-related musculoskeletal injuries. Because few of these injuries are accepted as coming only from work, the workplace hazard must often be identified to define an occupational injury. High physical stress can frequently be traced to ordinary work activities, including repetitive or sustained lifting, bending, twisting, climbing, reaching, gripping, pinching, rubbing, kneeling, and squatting, as well as vibration from equipment. Sometimes these activities are performed in awkward postures and involve high forces.

Scope of the National Problem

Although present surveillance systems are inadequate and estimates of the national problem may not be accurate, awareness is growing that these injuries result in significant human suffering, loss of productivity, and economic burden to the country. High risk industries include manufacturing, construction, and food processing. In the 1977 Health Interview Survey of the National Center for Health Statistics, musculoskeletal injuries ranked first in frequency among health problems that affect the quality of life. They are the leading cause of disability in the working years, affect 19 million persons annually, and involve nearly half the workforce at some time in their working life. The frequency and impact of these disorders are expected to increase in the future, and some increases are already evident with modern office technology. Although this equipment is designed to reduce physical labor, it often generates new, pervasive, and even more insidious sources of biomechanical stress.

Potential for Prevention and Control

An important first step in preventing musculoskeletal injuries is identifying their causes, but this is often difficult because of the many complex etiologic factors, long latency, effects of aging, and lack of standardized diagnostic criteria. Many biomechanical hazards, however, could be eliminated if knowledge already available were put to use (e.g., redesigning work processes or tools to impose less biomechanical stress). A management concept of "working smarter is better than working harder" will maintain better production levels than a demanding work schedule, since it reduces time lost due to work injuries. And, finally, cooperation on common prevention problems can be fostered among key professionals from different backgrounds (e.g., engineers and health care personnel) by dispensing and applying accumulated knowledge.

Tactical Areas of a Prevention Strategy

The present, inadequate surveillance systems do not separate chronic from acute musculoskeletal injuries nor do they have standard terminology for defining such conditions. New systems of both health and hazard surveillance are needed to identify occupations with a high incidence of musculoskeletal injuries and to define types and ranges of work-related biomechanical stresses. Multi-level data bases for the country, the States, and local areas will increase awareness within the medical community of the benefits of prevention and thereby help implement a prevention strategy.

Health professionals, engineers, and scientists must cooperate in using surveillance and clinical data to identify causes and effects from the interacting variables that produce musculoskeletal injuries. For example, (1) low back pain results from interacting job factors (e.g., load weight, location, and frequency of materials handling) and personal factors (age, gender, strength, fatigue, postural stress, trauma, emotional stresses, degenerative changes, congenital defects, physical fitness, and body awareness); (2) biomechanical analyses of hand and arm motions, repetition rates, amounts of force, and postural factors have helped identify stresses leading to carpal tunnel syndrome and tenosynovitis; and (3) injuries to lower extremities, mainly the knee, result from repetitive loading, constant kneeling, squatting, and contact with specialized tools. New evaluation and laboratory techniques are now available but more are needed to clarify the stress patterns.

The three approaches for controlling risk factors are redesigning jobs or tools, training workers, and selecting workers for specific jobs. (1) The use of ergonomics to design new jobs and tools is better than personal protective equipment or safe work practices, but this is still an undeveloped science, and research is needed on anatomic, mechanical, physical, and human factors. While initial costs and complications of overlapping stresses have prevented widespread use of ergonomics, the high costs of workers' compensation and rising insurance premiums may make ergonomics attractive for reducing medical costs and lost time from injuries and for increasing worker productivity. (2) The preventive value of training programs that teach employees specific work practices for safety and hygiene has been difficult to evaluate. Current programs seek to increase worker awareness of hazards and to help them participate in hazard control through problem-solving techniques. (3) Screening employees for specific jobs is difficult because of the wide variety of job demands and the range of individual physical capacities. Radiologic screening for back problems, although largely discredited, is still widely used and may pose a radiation hazard. Thus, ergonomics is the preferred approach, with employee selection and training as secondary elements.

Because awareness is essential for implementing any prevention strategy, information should be disseminated to help change attitudes and behavior of both management and workers, especially in the many small businesses that employ 25 or fewer workers. To accomplish this, the Educational Resource Centers (ERCs), medical schools, and schools of business can provide personnel trained in ergonomics for service at regional levels and can produce guides for users to prevent and control cumulative trauma. Modern technology for disseminating public service messages should also be explored.

Action plan

The knowledge and skills to implement many of the recommendations below are now available; others must await future advances. For now, the availability of trained health professionals and their degree of cooperation will determine progress in combating musculoskeletal problems in the workplace.

Committee: A multidisciplinary National Committee for Occupational Musculoskeletal Disorders should be established with representatives from industry, labor, academia, professional groups, and government. It could function as an advisory body to prevent musculoskeletal injuries by coordinating national efforts in research, training, and prevention and by promoting clinical and scientific consensus on definitions, diagnostic criteria, surveillance terms, and criteria for the outcomes of these injuries.

Training: More clinical personnel should be trained in the etiology of musculoskeletal disorders, and, with the help of the National Research Council's National Academy of Engineers and others, design engineers could be trained in biomechanics and ergonomics. Workers should be trained to participate in the redesign of jobs, tools, and workstations. Young investigators could be encouraged through post-doctoral grants and research assistantships to seek advanced training in preventing musculoskeletal injuries.

Surveillance and Research: Innovative surveillance systems must be developed with cooperating federal, State, and local officials to improve the understanding of the nature, extent, and magnitude of musculoskeletal problems. Longitudinal studies, evaluations of ergonomic hazards, and assessments of health effects of new emerging technologies (robots, electronic office operations) are needed. Grants from NIOSH and the National Science Foundation can promote research on etiology and prevention and on the relationship of certain job tasks to resultant injuries or disorders.

Coordinating Group Activities: State and local health agencies, universities, and community health groups could, through a grant mechanism, evaluate workplaces to identify traumatogens, determine the efficacy of proposed countermeasures and prevention strategies, and conduct demonstration studies in select, high-risk industries. The Institute of Industrial Engineers, industrial hygiene organizations, equipment manufacturers, and others could develop and test means for controlling cumulative trauma. The proposed National Committee could help coordinate activities of OSHA, MSHA, AIHA, and State and industry groups to formulate guidelines for ergonomic control and could encourage standard-setting groups, such as the American National Standards Institute, to develop consensus standards. The Committee could also evaluate the benefits of a national ordinance or generic standard for controlling biomechanical hazards, similar to the Swedish ordinance regulating work postures and working movements. (Danielson, et al, 1983)

Dissemination: The DHHS Office of Disease Prevention and Health Promotion along with local and regional health agencies could convey the true costs of musculoskeletal injury (in terms of economics and human suffering) to public and professional health societies through an awareness program. A model for dissemination should identify target groups, the types of messages needed, effective media, procedures for evaluating the effectiveness of information programs, and overall marketing plans for dissemination. The proposed National Committee could promote an interchange of information on basic research through symposia and workshops; a national clearinghouse of information could be established; and the results of worksite studies should be published in trade and management magazines. Labor and management should explore new ways of informing workers, especially those in small businesses and industries, of the causes, risk factors, prevention, and treatment of occupational musculoskeletal disorders. The occupational health nurse must be recognized as a first-line link between worker and health professionals, and worker-participation programs, such as the Ergonomic Task Force, should be employed to help introduce ergonomic changes.

OCCUPATIONAL CANCERS

Cancers induced by occupational exposures usually occur decades after the exposures take place. Most observed associations between exposure and occupational cancer involve tumors of a common type, such as lung cancer. Specific cancers sometimes occur in such a high fraction of workers that the work-related association is inescapable. In 1775, Sir Percivall Pott first identified an excess risk of cancer in an occupational group--cancer of the scrotum in chimney sweeps. This led to the first demonstrated prevention of cancer development in workers by interrupting the interactions of agent, environment, and host that take place as a result of workplace exposures. Since then, several other occupations have been shown to pose an increased risk of cancer, and, in the 20th century, other specific carcinogens have been identified as well.

Three health actions for prevention, outlined in the 1979 Surgeon General's Report on Health Promotion and Disease Prevention (USDHEW, 1979), can be applied to work-related exposures to carcinogens: *health protection* (activities to reduce exposure, such as redesigning the job), *health promotion* (helping workers develop and improve behaviors for good health, such as stopping the use of tobacco with its additive or synergistic effects on workplace exposures), and *health services* (although less satisfactory than the above, early detection may permit treatment and even cure of some cancers).

Scope of the problem

Conservative estimates attribute 17,000 cancer deaths each year to workplace exposures. Although over 100,000 workers are potentially exposed to the 21 chemicals now regulated by OSHA as carcinogens (NIOSH, 1978), adding the agents OSHA is currently considering for regulation and those recommended by NIOSH for control as carcinogens increases the total of potentially exposed workers to 3-9 million. Since such exposures are neither ubiquitous nor homogeneous but affect distinct populations to varying degrees, the cancer rates in specific populations may be substantially higher than expected.

Preventive actions

This strategy presents a continuum of potentially effective techniques for preventing occupational cancer, including what can be done now and what additional knowledge is needed.

Identifying and evaluating carcinogens: Epidemiologists, toxicologists, industrial hygienists, and safety engineers should coordinate efforts in research on carcinogens. Increased support for such research will help improve methods in epidemiology, toxicology, industrial hygiene, and screening. A committee of government, industry, labor, and academic experts should prepare a list of agents that warrant toxicologic and epidemiologic study and set priorities for research.

Setting standards: The most familiar mechanism for setting standards is through NIOSH recommendations to OSHA, which then promulgates standards. NIOSH can also provide technical assistance to MSHA, State governments, companies, and insurance carriers for setting standards. Additional recommendations come from such voluntary groups as the American Conference of Governmental Industrial Hygienists and the American Industrial Hygiene Association. To avoid the time needed to regulate carcinogens on an agent-by-agent basis, OSHA has promulgated a carcinogen policy that will help clear the backlog of unregulated carcinogens. More effort is needed to identify carcinogens in the workplace and to disseminate information to all potentially exposed groups, such as by a broad hazard communication standard. Some gaps in information must still be filled before priorities for epidemiologic and toxicologic studies can be set.

Elimination and substitution: When the risks of using an agent in the workplace exceed the benefits, the most effective way to eliminate exposure is to eliminate the agent. More detailed information is needed on the carcinogenic properties of agents currently used in the workplace and their possible substitutes. Lists of potential carcinogens, substitutes, and replacements should be developed and broadly disseminated.

Control technology: Engineering controls that enclose a system or provide ventilation are preferable to personal protective devices or work practices because they are perceived as less likely to fail. Studies should evaluate the effectiveness of control technologies and should identify examples of effective controls for specific agents. Information from these studies could be disseminated by a national clearinghouse, especially to small businesses.

Personal protective devices: Personal protective devices are necessary when the use of a carcinogen is essential and engineering controls are neither available nor adequate. Devices must be matched to specific agents because exposure may take place through inhalation, ingestion, or skin absorption. Some devices may even introduce hazards by interfering with vision, dexterity, or worker comfort. NIOSH should continue to certify respirators and alert users to possible failures or defects. A clearinghouse could be established to disseminate state-of-the-art information on personal protective devices.

Environmental monitoring: Environmental monitoring measures the amount of a carcinogen in the workplace, assesses the adequacy of engineering controls, and determines the need for personal protective devices. Validated strategies for such monitoring are needed, and NIOSH, MSHA, OSHA, industry, and others should press for better and more precise analytic methods that are as accurate in the field as the laboratory. NIOSH should continue to assure the accuracy of laboratory testing, and a surveillance system should be developed to collect, evaluate, and disseminate the results of environmental monitoring.

Biologic monitoring: Both the inherent biologic characteristics of individuals and the absorption of specific carcinogens can be determined by biologic monitoring. The efficacy of current methods must be assessed under field conditions and new methods developed where necessary. The value of new and current methods for determining the individual enzymatic constitution of workers and predicting carcinogenic risk must be measured. The proficiency of commercial laboratories that perform biologic testing should be ascertained. Surveying the results of current biologic monitoring will help identify worksites where exposures to carcinogens occur.

Medical screening: Evaluating the efficacy of such medical screening techniques as urinary and sputum cytology will enhance early detection of occupational cancers and thus permit treatment and awareness of risk. State-of-the-art information should also be updated and disseminated in NIOSH recommendations and in OSHA and MSHA regulations. We need to know the effectiveness of medical screening techniques and subsequent therapy and more effective methods of identifying populations with past exposure to carcinogens.

Health promotion: As an adjunct to the overall prevention strategy, health promotion can help eliminate personal behaviors--such as smoking--that may act synergistically with workplace exposures. Professional organizations, like the American Occupational Medical Association, the American Association of Occupational Health Nurses, and the American Industrial Hygiene Association, can be enlisted to help sensitize the health care establishment to specialized needs of certain occupational populations. Interaction between occupational exposures and personal health behaviors must be more clearly delineated.

Therapeutic health care and rehabilitation: Although the field of clinical oncology has burgeoned, training of personnel has lagged. Efforts by NIOSH, professional organizations, and the National Cancer Institute (NCI) are needed to increase educational materials, training programs, and certification for physicians and nurses in the field of occupational cancer. Placing experienced personnel in State and local agencies would increase awareness. Information from attempts at medical intervention is needed to assess the adequacy of early detection, therapy, and risk-reduction techniques. Identifying populations with increased risk of cancer or past exposures to carcinogens, particularly in small firms or those not covered by regulation, will help ensure timely application of diagnostic and therapeutic services.

Surveillance of disease: Because most cancers have such a long latency, surveillance of current disease may not identify current exposures. Nevertheless, some cancers may be sentinel health events that identify populations in need of medical intervention. Surveillance schemes should be evaluated for effectiveness. Acute illnesses, such as chrome dermatitis, may signal current exposures to carcinogens. Experienced personnel in local and State agencies can encourage interest in cancer detection, reporting, and prevention. Record systems, such as those collected by the Internal Revenue Service, the Social Security Administration, and Workers' Compensation, may aid epidemiologists.

Surveillance of exposure: The long latency also makes difficult the directing of society's resources to workplaces with the greatest potential for exposure to carcinogens. Although data collected in OSHA and MSHA compliance programs may help identify the extent and level of exposure to both regulated and unregulated carcinogens, better systems of surveillance are needed.

Compliance activities: OSHA conducts some inspections in response to requests and others targeted to "high-risk" industries, based on high infraction rates. OSHA's current policy should be evaluated to determine whether it adequately covers all potentially exposed workers. A national system should also target inspections to plants using regulated or suspected carcinogens, since the effects of exposure will not be manifest for 20-40 years.

Education of workers and managers: NIOSH, OSHA, MSHA, NCI, and others should strengthen their educational programs for workers and employers. A broad hazard communication standard could be effective in promoting worker awareness. The value of behavioral approaches and job-design factors in controlling cancer in the workplace should be established.

Free-market forces for prevention: Economic incentives, such as ensuring coverage by the insurance industry and compensation for victims of occupationally induced cancer, will help to encourage measures that prevent such cancers. The difficulty of establishing a causal relationship between exposure and disease must, of course, be overcome.

SEVERE OCCUPATIONAL TRAUMATIC INJURIES

Severe occupational traumatic injuries, including those sustained in work-related motor vehicle accidents, comprise such serious and disabling injuries as amputations, fractures, severe lacerations, eye losses, acute poisonings, and burns and may result in worker deaths. Accidents, in general, and the adverse effects that result from them are the leading cause of loss of potential productive years of life in this country. The National Institute for Occupational Safety and Health (NIOSH) estimates that at least 10 million persons suffer traumatic injuries on the job each year; about three million (30 percent) injuries are severe, and at least 10,000 are fatal (CDC, 1984). Occupational injuries in 1983 resulted in 80 million lost workdays and an estimated $33.4 billion in wage, insurance, medical, and administrative costs. These figures may even underestimate the total costs to industry and do not include the immeasurable toll in human suffering. Although rates of occupational fatalities and disabling injuries have fallen since the early 1970s, due partly to a growing workforce, the actual numbers have declined slowly, if at all, since 1945.

Intervention

Traditional approaches to preventing traumatic injuries or reducing their severity include removing hazards, placing barriers between hazards and workers, screening workers before employment, analyzing job hazards, improving job and tool design, complying with regulatory and consensus standards, and training workers to avoid hazards. The following strategy will take a dual approach, discussing the actions that can be taken immediately and then the long-term efforts for the future.

Epidemiology

In efforts to study the etiology of workplace injuries and fatalities, the discipline of epidemiology can serve as a common thread by helping to identify high-risk exposures and factors, evaluate both potential risk factors and appropriate control strategies, and assess progress in the control of traumatic injuries. As a key component in the epidemiologic process, surveillance must be applied both as an initial activity to establish baseline information and as a continuing activity to characterize how the national occupational safety experience is changing. Four basic aspects of occupational trauma must be considered: the task, the working environment, the machine, and the worker; modification of any one of these will affect the whole system. An overriding consideration must always be the needs of employers who manage these complex industrial systems.

What can we implement now?

Evaluation of effective safety programs has established that the most important component is management's commitment from the top down. Management accepts responsibility for tying all elements of the workplace together so that the interactions of task, environment, machine, and worker, as well as the energy releases associated with these interactions, can occur with the least possible unforeseen interruption.

Task-oriented strategies: Although safe work practices for hazardous operations and control methods for energy sources are available, failure to use them is responsible for a large number of occupational injuries and deaths. Employers are either unaware of hazards and control strategies or unable or unwilling to implement them. Job-hazard analysis plus timely reassessment or monitoring can help employers anticipate rather than react to hazards and should have a major impact on reducing national injury and death rates.

Environment-oriented strategies: While the physical environment of the workplace is the most obvious and the most amenable to change, the psychosocial and political/economic environments warrant further study for their impact on injuries. Over the past 50 years, studies of illumination, temperature, noise, vibration, relative humidity, and the layout and condition of the facility have resulted in guidelines to control these potential physical stressors. Failure to apply the guidelines results from cost constraints, inadequate dissemination of information, and improper management of safety programs. Prevention programs in the private sector have demonstrated trauma reductions and should be encouraged in other companies.

Machine-oriented strategies: The various forms of energy associated with machines, if not adequately controlled, can result in traumatic injuries to workers. Regulatory and consensus standards now exist to protect workers from interaction with industrial machines. Many of these standards propose placing barriers between the worker and the energy sources, such as guards on moving parts of machinery or protective equipment worn by the workers. Manufacturers are now producing safer and more functional machines, and procurement procedures should require the purchase of machinery that meets current standards.

Human-oriented strategies: The worker is the most complex entity in the workplace system and, as the employer's most valuable resource, should be carefully nurtured and protected. Effective information dissemination, education, and training of workers can have an immediate positive impact on the incidence of work-related injuries and deaths. As soon as hazards are identified, known intervention methods should be applied and workers should be supplied with the tools and knowledge to avoid traumatic injuries.

Knowledgeable, well-trained workers can avoid injury even during hazardous work, while untrained, uninformed workers can be injured under almost risk-free conditions. Thus, training is an integral component of trauma prevention. Although safety training begins in childhood, most job safety is learned on the job. Some regulatory agencies require training, but the degree and level of training vary widely. Model training programs could ensure more uniform and basic training in hazard awareness and trauma control. Employees in high-risk occupations should be the primary targets for such training, and retraining in different occupations will be important for workers who suffer permanent disabling injuries at work.

What knowledge do we need?

For management to select and operate safety programs efficiently, they must have access to cost-effective, scientifically proven methods that reduce injuries.

Task-oriented strategies: Although established countermeasures for occupational injuries may represent the best judgment of the trauma control community, they have not, through rigorous scientific studies, been demonstrated to be effective. Such measures would be more readily accepted if their effectiveness and cost benefit were known.

Environment oriented strategies: The influence of certain physical agents on the incidence of occupational traumatic injuries should be more carefully defined. The psychosocial environment, as it influences the perception of hazard and risk taking, is amenable to modification through advertising, information dissemination, and social interaction. Messages through the mass media should be specific, supportable, and persuasive enough to alter public perception so that occupational traumatic injuries and deaths are no longer considered either morally acceptable events or "chance" occurrences that are beyond human control.

Changes in the workforce and workplace, e.g., increasing numbers of women and of certain ethnic minorities and the increased use of computers and automated or programmable machines (robots), present unique and dynamic challenges for the prevention of traumatic injuries. Past failures to anticipate potential hazards of "new" technologies must not be repeated. New techniques for recognizing, analyzing, and mitigating hazards and for managing risk are emerging and should be nurtured, perhaps by establishing a center for research into the non-mechanistic arena of safety.

Increasing attention is being paid to the complex economic forces that influence the incidence of occupational traumatic injury and fatality. This is evident from the creation of a Workers' Compensation Research Institute and from analyses of the economic incentives and disincentives associated with workers' compensation. Employers are beginning to recognize the negative economic impact of traumatic injuries in lost workdays, high medical costs, loss of productivity, and increased insurance rates and liability claims. Data specific for industry and occupation would be helpful in these areas. Studies should be undertaken of the cost relationships of compensation, disability, and product liability insurance from the perspective of occupational trauma.

Machine-oriented strategies: Although present safety concepts involve barriers around hazardous machine parts, workers continue to experience injuries. Further studies are needed on the efficacy of these barriers and on the motivational and behavioral factors involved in their use. Standards for machine safety should be re-evaluated, and the technical basis for each standard should be understood by users. As faster and more efficient machines are developed, care must be taken to design safe methods of feeding and removing stock from the machine and to limit the speed within human tolerances.

Human-oriented strategies: As the workforce ages, traumatic injuries may increase because older workers are slower to react, have reduced ranges of motion, and are less tolerant of environmental changes such as extreme heat or cold. Although older workers are more cautious, the decreasing supply of younger workers may force the older ones to remain longer in high-risk jobs, thus increasing exposure to the hazards of traumatic injury.

Technology can be viewed on four levels: (1) workers supply both power and control, (2) tools supply power, and workers control it, (3) both power and information are supplied, and workers direct; and (4) power, control, and information are supplied in self-monitoring systems, and workers only intervene if something goes wrong. As technology progresses toward levels 3 and 4, and as service jobs become more prominent, training will become increasingly important. The adequacy of training policies and practices will require constant evaluation.

Little research has been directed to the relationship of human behavior to safe work activity, e.g., why workers circumvent safety devices or ignore safety rules when rescuing others. Most studies have focused on economic factors, but more attention to motivational issues is needed. Management should find ways to enlist the interest and cooperation of workers so that workers, unions, and management can work together to better understand and overcome hazards inherent in the workplace. The impact of such cooperation, e.g., quality circles in the automobile industry, needs further evaluation.

The roles of alcohol and drug abuse are well known in highway trauma but less understood in occupational settings. The work-related effect of these substances and their possible interaction with chemicals in the workplace require further study. NIOSH should cooperate with agencies that have responsibilities in areas of personal behavior and substance abuse and should increase their awareness of worker needs.

Risk-taking, a fundamental quality of the American spirit, is rewarded in society and the workplace, but must be tempered when it contributes to occupational trauma. Other aspects of human behavior, such as reactions to major life events (death, divorce, financial troubles), may also impact occupational safety. The increasing availability of employee counselors reflects the value employers are placing on the mental well-being of workers.

Rehabilitation of severely injured workers, while not preventive, can mitigate the severity of trauma by reducing prolonged disability, loss of income, and the impaired quality of life. Such evidence of management's commitment to employee well-being lends credibility to its prevention-oriented programs. Better techniques for diagnosis of injuries are needed, and sufficient time must be allowed to ensure the mental, psychological, and physical conditioning of workers for return to the workplace.

Recommendations

What can be done now: Model programs can be developed for successful prevention of occupational trauma and implemented through a workplace-specific, self-evaluation approach. Self evaluation involves the work force in anticipating and identifying hazards, developing and discriminating among existing controls, and tailoring the tools to a specific industry. Such evaluation should be voluntary and focused on high-risk industries and specific worker populations that may be high risk and/or neglected by regulations.

Research on the prevention of occupational trauma, especially interdisciplinary research, should be stimulated by such means as national grant programs. The results of these and similar studies must be easily accessible, perhaps through broadened information centers, and should be available in both hard copy and through electronic access. A knowledge of injury-control methods should be brought to the attention of educational institutions, professional societies, accreditation bodies, and State and local agencies so that educational institutions will be influenced to adopt trauma-control courses or modules into their curricula. Education and training models for specialists, managers, supervisors, and workers should include techniques for identifying, evaluating, and controlling hazards, and ranking the consequences of hazards; guidelines for selecting training materials and methods; and methods for evaluating training and post-training management.

Enforcement agencies should use their resources and authority to ensure that appropriate safeguards are installed and used, especially on mechanical power presses. All guards should be integral, non-removable parts of the machine design, and workers and managers alike should clearly understand the hazard posed by the machine and the value of the guard. Existing occupational consensus standards and codes should be reevaluated and a technical basis established for each so that new information can be easily incorporated as it emerges. The results of product liability litigation should be monitored for their influence on product designers and to identify potential increased risk to workers. Findings should be widely disseminated to responsible groups.

Longer term actions: Surveillance of occupational traumatic injury is currently limited by the inadequacies and the redundancies of existing documentation and reporting systems. A national surveillance system is needed that will include information on products, engineering controls, personal protective equipment, job title and tasks, worker characteristics (training, experience, and shift factors), compliance with standards, and location of accident--in short, the optimal elements to fulfill all current and anticipated uses of such data. All possible sources must be tapped, including reports from hospitals, medical examiners, and accident investigations. Until such a system is developed, existing systems can be expanded and the collection of industry-specific data can be explored. In addition, ways might be found to release--for trauma-control research--data that are currently protected by the Privacy Act, while still protecting the sensitive nature of the data.

Epidemiologic studies are needed to describe the magnitude and characteristics of specific traumatic injuries and to evaluate the efficacy of specific prevention measures. These studies can reduce current information gaps, such as incorrect statistics on traumatic injury, unsubstantiated conclusions about what influences the risk of injury (training, worker behavior, experience, supervision), and data on the feasibility and success of prevention measures.

The continuing toll of occupational injuries suggests that current programs are not working, perhaps because resources are not available or because the personnel involved are not familiar with specific problems in specific industries. A possible solution to be explored is the formation of private, nonprofit, industry-specific associations for research (not regulatory) purposes (e.g., the Construction Safety Association of Ontario). Existing national programs could help promulgate regulations, develop scientific methods, and generate research tools for the associations.

Chemicals, medications, and other substances, encountered through both personal use and workplace exposure, may increase the risk of traumatic injury. These hazards must be identified, workers should be screened for susceptibility to them, and effective employee assistance programs should be made available nationwide.

OCCUPATIONAL CARDIOVASCULAR DISEASES

Cardiovascular diseases, e.g., ischemic heart disease and hypertensive, cerebrovascular, and peripheral vascular diseases are the leading cause of disability and death in the United States, accounting for almost a million deaths (986,000) in 1984 (NCHS, 1986). Direct and indirect economic costs amounted to approximately $102.4 billion in 1983. The 34 percent decline in coronary heart disease since 1972 demonstrates the potential effectiveness of programs directed at risk factors for such diseases. Coronary heart disease, hypertension, and related entities are included in this prevention strategy because of their high incidence, whereas the less common arrhythmias, cardiomyopathies, and other forms are more directly related to specific occupational exposures. These latter conditions are given specific emphasis here because of their vulnerability to intervention in the workplace.

Risks and the workplace

Millions of workers are currently exposed to work-related factors; chemical, physical, and psychosocial, associated with increased risk of cardiovascular disease. Many personal risk factors are also known. Some personal factors are unalterable, e.g., age, gender, and family history; others are alterable, e.g., cigarette smoking, dietary intake, hypertension, excessive alcohol intake, obesity, diabetes, inadequate physical activity, and behavioral pattern. Preventive programs directed at the alterable risk factors are effective in reducing the occurrence of cardiovascular disease, and the workplace is an excellent site for disseminating messages and programs designed to change these personal risk factors. Where possible, this strategy will combine the two approaches: preventing work-related risk factors and enhancing the prevention of personal risk factors.

Cardiotoxic exposures in the workplace: Several chemical and physical agents--such as carbon disulfide, carbon monoxide, halogenated hydrocarbons, nitroglycerine, heat, and noise--are known to increase the risk of cardiovascular disease. In addition, nearly 1,500 chemicals have been identified with possible cardiovascular effects. The complexity of the disease process, the long latency, and the diversity of workplace exposures during a given lifetime make the study of relationships between occupational exposures and cardiovascular disease difficult.

Reducing exposures to known cardiotoxins requires identifying the exposures, communicating with exposed workers, complying with current exposure criteria, implementing control technology and environmental control programs, improving monitoring, developing protective equipment, and adopting new or improved exposure standards. Ideally, these environmental efforts should be combined at the worksite with efforts to reduce such personal risks as smoking, elevated blood cholesterol, elevated blood pressure, and sedentary lifestyle. Individual situations, however, must dictate the balance between these two approaches.

Better medical, epidemiologic, and toxicologic studies will be needed to determine the specific effects of chemical and physical agents on the cardiovascular system and the interaction of these agents with personal lifestyle factors. An epidemiologic group for cardiovascular disease could be formed within NIOSH to help focus that agency's studies and to coordinate a program with outside groups; coordination with the National Heart, Lung, and Blood Institute will be particularly important. New methods must be developed to screen chemical substances, delineate mechanisms of toxicity, monitor exposures, and assess the value of training, education, and information dissemination.

Psychosocial factors: Studies showing an association of work-related psychosocial factors with increased risk of cardiovascular disease have linked specific factors to specific manifestations of disease. Inconsistent results from some of these studies may be due to slightly different methodologies and to lack of control for other risk factors. Further research is sorely needed to determine the specific underlying factors that cause increased risk of cardiovascular disease, to assess workplace psychosocial factors, to determine the job-related stress of new technologies, and to evaluate the effectiveness of programs designed to correct the problems.

Health promotion: Even for occupational and industrial groups with increased risk primarily from personal factors, the prevention of cardiovascular disease related to these factors is a worthy goal. The workplace is a highly attractive site for delivering health promotion and employee assistance programs. Success of such programs will require union and management cooperation, employee involvement, adequate allocation of resources, control at the local level, attention to ethical issues, confidentiality of medical information, and voluntary participation. These programs should be made increasingly available, especially to high risk groups. Structured follow-up and evaluations should be included to assess the overall effectiveness of the efforts.

Summary

Although our knowledge of the relationship between workplace exposures and cardiovascular disease is incomplete, the morbidity and mortality resulting from cardiovascular disease in this country is extensive. Important steps should be taken now to help reduce this toll.

References:

1. The Association of Schools of Public Health under a cooperative agreement with the National Institute for Occupational Safety and Health (1986): Proposed National Strategies for the Prevention of Leading Work-Related Diseases and Injuries, Part 1. Washington, D.C.
2. CDC (1983): Leading Work-Related Diseases and Injuries--United States (Occupational Lung Diseases). MMWR 32:24-6, 32.
3. CDC (1984): Leading Work-Related Diseases and Injuries--United States (Severe Occupational Traumatic Injuries). MMWR 33:213-5.
4. Danielson G, Edstrom R, Lindh G (1983): Ordinance Concerning Work Postures and Working Movements. Regulation (AFS 1983:6) issued by the National Board of Occupational Safety and Health. Stockholm, Sweden.
5. National Center for Health Statistics (1986): Monthly Vital Statistics Report. Advance Report of Final Mortality Statistics, 1984. Vol. 35, #6, Suppl. 2. Washington, D.C.
6. NIOSH (1978): Analysis of data gathered in the National Occupational Hazard Survey, 1972-1974 (unpublished).
7. U.S. Department of Health, Education, and Welfare, Public Health Service (1979): Healthy People: The Surgeon General's Report on Health Promotion and Disease Prevention. Washington, D.C.: Office of the Assistant Secretary for Health, and Surgeon General, DHEW (PHS) Publication No. 79-55071.
U.S. Department of Health and Human Services, Public Health Service (1980): Promoting Health/Preventing Disease: Objectives for the Nation. Washington, D.C.: U.S. Government Printing Office.

DISORDERS OF REPRODUCTION

Since antiquity, certain chemical and physical agents have been recognized as having detrimental effects on human reproduction. For example, the effect of industrial lead poisoning in inducing abortions was noted by the Romans and again in the first decade of this century (6). Evidence from more recent laboratory studies and clinical investigations indicates that a wide range of microbiologic, physical, and chemical agents, such as Brucella, rubella, ionizing and nonionizing radiation, heat and vibration, tobacco, alcohol, and certain drugs, can adversely affect reproductive outcomes. At least 50 chemicals--including heavy metals, such as lead and cadmium glycol ethers, organohalide pesticides, organic solvents, and chemical intermediates, such as styrene and vinyl chloride--in widespread use in industry have been shown to produce impairment of reproductive functions in animals (7).

Until recently, the potential hazards to human reproduction posed by occupational exposures received little attention. However, adverse effects after thalidomide exposure in the 1960s and the occurrence in 1970 of methylmercury poisoning among residents of Minamata, Japan, dramatically demonstrated the teratogenic potential of chemical exposures. Those events and the increasing entry of women into the workforce focused greater attention on the potential hazards to female reproductive functions of occupational exposures. In the late 1970s, the demonstration of sterility among male workers exposed to dibromochloropropane was described; this drew attention to the concomitant potential for hazards to male reproductive function (8).

Occupational exposures can produce a wide range of adverse effects on reproduction. The effects of parental exposure before conception to agents toxic to reproductive functions may be evident as reduced fertility, unsuccessful fertilization or implantation, or an abnormal fetus. Maternal exposure after conception may result in death of the fetus or structural and functional abnormalities in the newborn. Other possible adverse outcomes include spontaneous abortions (both early and late), major and minor birth defects, perinatal death, low birth weight, altered sex ratio, developmental or behavioral disabilities, and transplacental exposure to carcinogen (9-11).

Estimates of the prevalence of adverse reproductive outcomes indicate that these events occur with considerable frequency in the U.S. population. For example, an estimated 560,000 infant deaths, spontaneous abortions, and stillbirths occur each year. The March of Dimes estimates that 200,000 live infants with some type of birth defect--benign or disabling--are born in the United States each year (9). The causes of most of these adverse outcomes are unknown. For example, 6-30 percent of the infertile couples have no recognized anatomic or physiologic abnormalities to account for the infertility (10); neither the etiology of sperm abnormalities nor the cause of sister-chromatid exchange in spontaneous abortions has been established (11,12). The causes for as many as 65-70 percent of the birth defects are not known (13).

Maternal Exposures: Studies of occupational reproductive hazards to date have consisted mainly of epidemiologic surveys of pregnancy outcomes following maternal exposures. Such studies have shown increased rates of spontaneous abortions among laboratory and chemical workers (14,15) and among workers exposed to lead (16), ethylene oxide (17), and anesthetic gases (18,19). Studies of adverse outcomes of pregnancy, however, are subject to several methodologic limitations. For example, the detection of rare outcomes, such as birth defects, requires the study of several thousand pregnancies, and retrospective studies are subject to problems of recall and misclassification, both of reproductive events and of exposures (20,21). The timing, duration, and frequency of exposure before and during pregnancy may critically affect reproductive outcomes (22). For example, exposure to ionizing radiation during the first trimester may result in microcephaly and mental retardation, and exposure during the third trimester may produce low birth weight and neonatal death (11). Other studies have been limited by the selection of inadequate comparison groups or the failure to examine the influence of other factors, such as alcohol and tobacco consumption or maternal age, that affect reproductive outcomes.

Paternal Exposures: Since azoospermia (absence of living spermatozoa in the semen) and oligospermia (subnormal concentration of spermatozoa) were reported in 1977 among workers exposed to dibromochloropropane (8), at least 14 studies have examined the quality of semen in workers exposed to lead, carbon disulfide, anesthetic gases, ionizing radiation, toluenediamine, dinitrotoluene, carbaryl, and several other pesticides (10). Adverse effects on the quality of semen were reported in workers exposed to lead or ionizing radiation. In other studies, e.g., of exposures to ethylene dibromide, results were inconclusive because of problems in design of the study or inadequate numbers of participants (10). CDC recently used data collected by the Metropolitan Atlanta Congenital Defects Program to examine the risk of serious structural birth defects among the children of male Vietnam veterans; no statistically excessive risks were noted (23). In general, relatively few studies have been conducted of reproductive outcomes associated with paternal exposures (9).

Extent of potential exposures: Estimates have been made of the number of workers potentially exposed to selected agents known or suspected to be toxic to reproductive function. NIOSH estimates that approximately 200,000 workers are potentially exposed to various glycol ethers (24), several of which exhibit marked testicular toxicity in animals (25). An estimated 9 million workers are exposed to radiofrequency- microwave radiation (26), which has been shown to cause embryonic death and impaired fertility in animals but which has yet to be studied adequately in humans. NIOSH has estimated that approximately 50,000 personnel in hospital operating rooms are potentially exposed to waste anesthetic gases, and 139,000 hospital and other industrial workers may be exposed to ethylene oxide (24); both agents have been linked to an increased risk of spontaneous abortions in humans.

The extent to which occupational exposures in American workers produce adverse reproductive outcomes is largely unknown. However, the information presented here suggests that the problem is both widespread and serious. Epidemiologic and toxicologic research into the reproductive effects of occupational exposures is in its infancy. There is a continuing effort to elucidate the etiology of adverse reproductive outcomes, such as fetal chromosomal abnormalities or abnormal spermatogenesis and to develop improved animal models for screening agents for possible mutagenic and toxic effects related to human reproduction. Registries for the surveillance of outcomes of reproduction, such as CDC's Birth Defects Monitoring Program (9), and improved methodologies developed to evaluate such parameters as quality of semen (12) and outcomes of pregnancy (20), will permit further identification of specific occupational hazards to reproduction. When such hazards are identified and controlled in the workplace, the prevention of reproductive disorders in the population as a whole will be substantially improved.

Reported by Industrywide Studies Br, and Surveillance Br, Div of Surveillance, Hazard Evaluations, and Field Studies, National Institute for Occupational Safety and Health, CDC.

References

1. CDC. Leading work-related diseases and injuries--United States. MMWR 1983;32:24-6, 32.
2. CDC. Leading work-related diseases and injuries--United States MMWR 1983;32:189-91.
3. CDC. Leading work-related diseases and injuries--United States. MMWR 1984;33:125-28.
4. CDC. Leading work-related diseases and injuries--United States. MMWR 1984;33:213-5.
5. CDC. Leading work-related diseases and injuries--United States. MMWR 1985;34:219-22, 227.
6. Hamilton A. Women in the lead industries. Bureau of Labor Statistics Bulletin No. 253. Washington, D.C.: U.S. Department of Labor, 1919. In: Hunt V. Work and the health of women. Boca Raton, Florida: CRC Press, Inc. 1979.
7. Barlow SM, Sullivan FM. Reproductive hazards of industrial chemicals: an evaluation of animal and human data. London: Academic Press, 1982.
8. Whorton D, Krauss RM, Marshall S, Milby TH. Infertility in male pesticide workers. Lancet 1977;ii:1 259-61.
9. Bloom AD, Paul NW, eds. Guidelines for studies of human populations exposed to mutagenic and reproductive hazards: proceedings of conference held January 26-27, 1981, in Washington, D.C. sponsored by Centers for Disease Control. White Plains, New York: March of Dimes Birth Defects Foundation, 1981.
10. Ratcliffe JM. Altered fertility. In: Review of occupational hazards to reproductive health. Geneva, Switzerland: World Health Organization (in press).
11. Strobino BR, Kline J, Stein Z. Chemical and physical exposures of parents: effects on human reproduction and offspring. Early Hum Dev 1978;1:371-99.
12. Wyrobek AJ. Methods for evaluating the effects of environmental chemicals on human sperm production. Environ Health Perspect 1983;48:53-9.
13. Wilson JG. Environment and birth defects. New York: Academic Press, 1973.
14. Strandberg M, Sandback K, Axelson O, Sundell L. Spontaneous abortions among women in hospital laboratory. (Letter) Lancet 1978;i:384-5.
15. Hemminki K, Franssilla E, Vainio H. Spontaneous abortions among female chemical workers in Finland. Int Arch Occup Environ Health 1980;45:123-6.
16. Nordstrom S, Beckman L, Nordenson I. Occupational and environmental risks in and around a smelter in northern Sweden. V. Spontaneous abortion among female employees and decreased birth weight in their offspring. Heriditas 1979;90:291-6.
17. Hemminki K, Mutanen P, Saloniemi I, Niemi ML, Vainio H. Spontaneous abortions in hospital staff engaged in sterilising instruments with chemical agents. Br Med J 1982;285:1461-3.
18. Cohen EN, Gift HC, Brown BW, et al. Occupational disease in dentistry and chronic exposure to

trace anesthetic gases. J Am Dent Assoc 1980;101:21-31.

19. Cohen EN, Brown BW, Bruce DL, et al. Occupational disease among operating room personnel: a national study. Anesthesiology 974; 41:321-40.
20. Selevan SG. Design considerations in pregnancy outcome studies of occupational populations. Scand J Work Environ Health 1981;7:76-82. occupational populations.
21. Buffler PA. Some problems involved in recognizing teratogens used in industry. Contributions to epidemiology and biostatistics 1979; 1:118-37.
22. Gordon JE. Assessment of occupational and environmental exposures. In: Bracken, MB, ed. Perinatal epidemiology. New York: Oxford University Press (in press).
23. Erickson JD, Mulinare J, McClain PW, et al. Vietnam veterans' risks for fathering babies with birth defects. JAMA 1984;252:903-12.
24. National Institute for Occupational Safety and Health. National Occupational Hazard Survey. Projected estimates of potentially exposed workers. Cincinnati, Ohio: National Institute for Occupational Safety and Health, December 1977 (DHEW [NIOSH] publication no. 78-114).
25. National Institute for Occupational Safety and Health. Glycol ethers. Current Intelligence Bulletin No. 39. Cincinnati, Ohio: National Institute for Occupational Safety and Health, 1983 (DHHS [NIOSH] publication no. 83-112).
26. Centaur Associates, Inc. final report; study of radio frequency and microwave radiation (phase 1). Prepared for the Occupational Safety and Health Administration; 1982.

NEUROTOXIC DISORDERS

Diseases of the nervous system resulting from toxic exposures in the workplace were known as early as the first century A.D., when Pliny identified palsy as a manifestation of lead poisoning among workers exposed to lead dust (7). In 1557, Jean Fernel linked gingival pigmentation, tremor, and behavioral changes to occupational mercury poisoning (8); in the nineteenth century, Delpech recognized rubber processing as the cause of the bizarre psychoses occurring among French workers who manufactured condoms and balloons in small cottage industries. Later, carbon disulfide was implicated as the specific neurotoxic agent (9).

Industrial hygiene practices have improved in the twentieth century, and some animal models of neurotoxic disease have been developed. In addition, workers who become ill often draw attention to outbreaks of neurotoxic diseases. Despite the prior identification of acrylamide as neurotoxic in animals, its neurotoxicity in humans was first recognized in the 1950s, when several Japanese workers involved in a pilot production project developed peripheral neuropathy (10). During the 1960s and early 1970s, dozens of cases of neuropathy occurred among Japanese and Italian workers exposed to solutions containing n-hexane during the manufacturing of shoes (11). Subsequently, high doses of n-hexane were found to be neurotoxic in exposed animals. In the past 15 years alone, outbreaks of serious human neurotoxicity occurred among workers exposed to three substances not previously known to be neurotoxic: the chlorinated hydrocarbon, chlordecone, which caused opsoclonus, tremor, disturbances of gait, and changes in personality (12); and two hexacarbons, methyl-n-butyl ketone and 2-t-butylazo-2-hydroxy-5-methylhexane, both of which caused a predominantly peripheral neuropathy (13,14).

Nature of Neurotoxic Disorders: Neurotoxic disorders are on the NIOSH list of Ten Leading Work-Related Diseases and Injuries (1) because of their potential severity--as exemplified by the neurotoxicity of chlordecone--and because of the large number of workers potentially at risk. A conservative estimate of the workers exposed full time to one or more neurotoxic agents is 7.7 million (15). The number of potentially neurotoxic chemicals found in the workplace exceeds 850.

Clinically, symptoms and signs of neurotoxicity can be diverse. Depending on the intensity of exposure, the molecular configuration of the agent, and the mechanism of toxicity, either central or peripheral neurologic effects may predominate. Most neurotoxic chemicals, however, affect both the central and peripheral nervous systems. Because the symptoms of peripheral neuropathy are more specific and the nerves themselves more directly accessible to precise diagnostic examinations, the effects of neurotoxic agents on the peripheral nervous system are usually more easily identified than effects on the central nervous system (CNS). Early symptoms of peripheral neuropathy may include numbness, tingling, or pain in the feet or hands. As the disease progresses, clumsiness or incoordination due to both sensory and motor changes may develop. Production workers may find their ability to do usual work partially or fully impaired. Chemicals used extensively in industry, which cause peripheral neuropathy when present in sufficiently high and persistent concentrations, include: lead, n-hexane, acrylamide, carbon disulfide, mercury, and methyl bromide (17,18). Several chemicals are known to cause selective impairment of cranial-nerve function, including dysfunction of the fifth cranial nerve (trichloroethylene) (18).

The effects of neurotoxic agents on the CNS present a far wider range of disturbances (16,18,19). At times, the most striking effects are changes in mood and personality (20). High levels of exposure to manganese or carbon disulfide produce psychoses and suicidal tendencies. Delusions and hallucinations may result from exposure to high concentrations of solvents, such as methylene chloride. Manifestations of cognitive dysfunction, such as reduced attention span, lack of alertness, and memory loss, are prominent neurotoxic effects that may occur in addition to personality changes after exposure to many solvents and to asphyxiants, such as carbon monoxide. Other neurologic effects occur under certain restricted conditions of exposure to unique chemical substances.

Although research into the neurobehavioral effects of industrial chemicals is relatively new, early results suggest that occupational neurotoxicity may be a larger problem than previously suspected. Sensitive methods for evaluating subtle losses in cognitive function have only recently been applied to the evaluation of exposed workers. Because of the complexity of the nervous system and the variety of potentially neurotoxic exposures, the true scope of this health hazard in the workplace is unknown.

Studies of the neurotoxicity of workplace chemicals demonstrate the problems encountered in recognizing occupational disease in general. Despite occasional large and dramatic outbreaks of neurotoxic disorders, such as those mentioned above, more often small numbers of workers in many workplaces are chronically exposed to neurotoxic agents that subtly and slowly alter nervous-system functions. Several neurotoxic syndromes mimic diseases of nonoccupational and "idiopathic" etiology, e.g., the toxic axonopathy associated with exposure to various metals and solvents, the parkinsonian syndrome of chronic intoxication with manganese, and the organic brain syndrome of chronic solvent intoxication. Because of these similarities to other nonoccupational diseases, such cases are frequently not identified as occupational in origin. In addition, many physicians are not trained to take an adequate occupational medical history (21). For these reasons, the prevalence of occupational neurologic disease is unknown, and important causal relationships between chemicals and disease remain obscure.

The prevention of neurotoxicity among workers will require strategies such as those suggested in the 1990 Objectives for improving the nation's health (22), developed by the U.S. Public Health Service: (1) analyses of structural analogues of known neurotoxic agents in an effort to predict the neurotoxicity of untested chemicals; (2) continuing search for animal models of disease; (3) ongoing research in establishing an acceptable human exposure level for identified neurotoxic agents; (4) epidemiologic evaluations of suspected neurotoxicity; (5) development of simple screening tools for use on asymptomatic populations exposed to known neurotoxic agents; and (6) premanufacturing and premarket testing of new chemicals as required by the Toxic Substances Control Act (23). As in the prevention of other work-related diseases, however, the most direct and effective method for preventing neurotoxic illness will continue to be the environmental control of exposures to neurotoxic chemicals. Such efforts as the substitution of less toxic substances where possible, engineering controls, teaching appropriate work practices, and educating workers about the potential neurotoxicity of chemicals will aid a comprehensive prevention effort.

Reported by Div of Biomedical and Behavioral Science, and Div of Surveillance, Hazard Evaluations, and Field Studies, National Institute for Occupational Safety and Health, CDC.

References

1. CDC. Leading work-related diseases and injuries--United States. MMWR 1983;32:24-6, 32.
2. CDC. Leading work-related diseases and injuries--United States. MMWR 1983;32:189-91.
3. CDC. Leading work-related diseases and injuries--United States. MMWR 1984;33:125-8.
4. CDC. Leading work-related diseases and injuries--United States. MMWR 1984;33:213-5.
5. CDC. Leading work-related diseases and injuries--United States. MMWR 1985;34:219-22, 227.
6. CDC. Leading work-related diseases and injuries--United States. MMWR 1985;34:537-40.
7. Hunter D. The diseases of occupations. Sixth edition. London:. Hodder and Stoughton, 1978;251.
8. Chang LW. Mercury. In: Spencer PS, Schaumburg HH, eds. Experimental and clinical neurotoxicology. Baltimore, Maryland: Williams & Wilkins, 1980;508-26.
9. Seppalainen AM, Haltia M. Carbon disulfide. In: Spencer PS, Schaumburg HH, eds. Experimental and clinical neurotoxicology. Baltimore, Maryland: Williams & Wilkins, 1980;356-73.
10. Le Quesne PM. Acrylamide. In: Spencer PS, Schaumburg HH, eds. Experimental and clinical neurotoxicology. Baltimore, MD
11. Spencer PS, Couri D, Schaumburg HH. n-hexane and methyl n-butyl ketone. In: Spencer PS, Schaumburg HH, eds. Experimental and clinical neurotoxicology. Baltimore, Maryland: Williams & Wilkins, 1980;456-75.
12. Taylor JR, Selhorst JB, Calabrese VP. Chlordecone. In: Spencer PS, Schaumburg HH, eds. Experimental and clinical neurotoxicology. Baltimore, Maryland: Willias & Wilkins, 1980;0407-21.
13. Allen N, Mendell JR, Billmaier DJ, Fontaine RE, O'Neill JO. Toxic polyneuropathy due to methyl n-butyl ketone. An industrial outbreak. Arch Neurol 1975;32:209-18.
14. Horan JM, Kurt TL, Landrigan PJ, Melius JM, Singal M. Neurologic dysfunction from exposure to 2-t-butylazo-2-hydroxy-5-methylhexane (BHMH): a new occupational neuropathy. Am J Public Health 1985;75:513-7.
15. National Institute for Occupational Safety and Health. National Occupational Hazard Survey, 1972-74. Cincinnati, Ohio: National Institute for Occupational Safety and Health, 1977. (DHEW [NIOSH] publication no. 78-114).
16. Anger WK, Johnson BL. Chemicals affecting behavior. In: O'Donoghue JD, ed. Neurotoxicity of Industrial and Commercial Chemicals. Boca Raton, Florida: CRC Press (in press).
17. O'Donoghue JL, Nasr AN, Raleigh RL. Toxic neuropathy--an overview. J Occup Med 1977;19:379-82.

18. Baker EL. Neurologic and behavioral disorders. In: Levy BS, Wegman DH, eds. Occupational health: recognizing and preventing work-related disease. Boston: Little, Brown and Co., 1983: 317-30.
19. Johnson BL, Baker EL, Gilioli R, Xintaras C, eds. Prevention of neurotoxic illness in working populations. Geneva: World Health Organization (in press).
20. Baker EL, Bus JS, Cranmer JM, et al. Workshop on neurobehavioral effects of solvents--consensus summary. Neurotoxicology 1985;6:99-102.
21. Goldman RH, Peters JM. The occupational and environmental health history. JAMA 1981; 246:2831-6.
22. U.S. Public Health Service. Occupational safety and health. In: Promoting health/preventing disease: objectives for the nation. Washington, D.C.: U.S. Department of Health and Human Services, Fall 1980; 39-43.
23. Toxic Substances Control Act. Public Law No. 94-469, 90, Stat. 2003, 1976. Maryland: Williams & Wilkins, 1980;309-25.

NOISE-INDUCED HEARING LOSS

Occupational deafness was first documented among metalworkers in the sixteenth century (8). Since then, workers have experienced excessive hearing loss in many occupations associated with noise. Noise-induced loss of hearing is an irreversible, sensorineural condition that progresses with exposure. Although hearing ability declines with age (presbycusis) in all populations, exposure to noise produces hearing loss higher than that resulting from the natural aging process; this is caused by damage to nerve cells of the inner ear (cochlea) and, unlike some conductive hearing disorders, cannot be treated medically.

While loss of hearing may result from a single exposure to a very brief impulse noise or explosion, such traumatic losses are rare. In most cases, noise-induced hearing loss is insidious. Typically, it begins to develop at 4,000 hertz (Hz, or cycles per second) in the hearing range of 20 Hz to 20,000 Hz and spreads to lower and higher frequencies. Often, material impairment has occurred before the condition is clearly recognized.

Such impairment is usually severe enough to permanently affect a person's ability to hear and understand speech under everyday conditions. Although the primary frequencies of human speech range from 200 Hz to 2,000 Hz, research has shown that the consonant sounds, which enable people to distinguish words such as "fish" from "fist," have still higher frequency components. As a result, an average hearing threshold (lowest audible sound level) at separate frequencies of 1,000 Hz, 2,000 Hz, and 3,000 Hz is used widely to define material impairment caused by noise (10,11). Recent estimates by the Occupational Safety and Health Administration (OSHA) indicate that about 9,400,000 U.S. production workers (7,900,000 active and 1,500,000 retired) either now work or have worked in industrial locations where noise-exposure levels are 80 decibels (dBA) or higher. This estimate includes most noisy workplaces in the United States, except agricultural, mining, construction, transportation, and government (11). At exposure levels below 80 decibels (weighted to the approximate response of the human ear), an increased risk of hearing loss caused by occupational noise has not been found. Based on the average hearing threshold level at 1,000 Hz, 2,000 Hz, and 3,000 Hz, OSHA estimates that 1,624,000 (17 percent) production workers have at least mild hearing loss resulting from their occupational noise exposures; 1,060,000 (11 percent) have material hearing impairment; and 473,000 (5 percent) have moderate to severe impairment (11). These estimates generally agree with NIOSH survey findings, which indicate that one-fourth of persons 55 years of age or older who have been exposed over their working lifetime to an average of about 90 dBA have developed a material hearing impairment caused by occupational noise exposure (10,12). An estimated $835 million will be paid in workers' compensation claims for occupational hearing impairment for the 10-year period 1978-1987 (13).

Occupational noise-induced loss of hearing is preventable. In its 1990 Objectives for the Nation, the U.S. Public Health Service set an objective that "By 1990, the prevalence of occupational noise-induced hearing loss should be reduced to 415,000 cases" (14). This objective relates to the number of cases of hearing loss that result in moderate to severe impairment. However, it is important to note that if the number of moderate to severe impairments is reduced, the number of mild hearing loss and of material impairments would be reduced proportionately. OSHA has estimated that within 10 years, the number of cases of noise-induced hearing impairment can be reduced by 20 percent if all workers exposed to noise levels higher than 85 dBA wear personal hearing protectors (earplugs or muffs) and receive on the average a 15 dBA noise reduction (11). However, this estimate hinges on effective use of hearing protectors to an extent that has not yet been demonstrated for all workers. NIOSH field investigations of industrial workers who routinely use earplugs indicate average noise reduction ranging from 7 dBA to 20 dBA, depending on the type of plug used (15).

A noise-control/hearing-conservation program is the most important step in eliminating occupational hearing loss. Such a program must include:

1. Reduction of noise through engineering controls, and the purchase of new, noise-engineered equipment.
2. Proper fit of personal hearing-protection devices.
3. Education of workers and managers about certain characteristics of noise-induced loss of hearing.
4. Proper periodic audiometric testing and notification of workers who are developing hearing loss.
5. Visible commitment of management and workers to the program.

The joint efforts of management, labor, and health-care providers are needed to establish effective hearing-conservation programs in industry. All interested groups must work together to achieve the goal of protecting workers' hearing.

Reported by Physical Agents Effects Br, Div of Biomedical and Behavioral Science, National Institute for Occupational Safety and Health, CDC.

References

1. CDC. Leading work-related diseases and injuries--United States. MMWR 1983;32:24-6, 32.
2. CDC. Leading work-related diseases and injuries--United States. MMWR 1983;32:189-91.
3. CDC. Leading work-related diseases and injuries--United States. MMWR 1984;33:125-8.
4. CDC. Leading work-related diseases and injuries--United States. MMWR 1984;33:213-5.
5. CDC. Leading work-related diseases and injuries--United States. MMWR 1985;34:219-22, 227.
6. CDC. Leading work-related diseases and injuries--United States. MMWR 1985;34:537-40.
7. CDC. Leading work-related diseases and injuries--United States. MMWR 1986;35:113-6, 121-3.
8. Alberti (1591), cited by Bunch CC. Traumatic deafness. In: Fowler EP Jr, ed. Medicine of the ear, Chapter X (Reprinted, Translations of the Beltone Institute for Hearing Research, No. 23, 1970).
9. Michael PL. Physics of sound. In: NIOSH. The industrial environment--its evaluation and control. Cincinnati, Ohio: National Institute for Occupational Safety and Health, 1973.
10. NIOSH. Criteria for a recommended standard . . . occupational exposure to noise. Department of Health, Education, and Welfare, Health Services and Mental Health Administration, 1972; (NIOSH) publication no. HSM 73-11001.
11. Occupational Safety and Health Administration. Final regulatory analysis of the hearing conservation amendment. Department of Labor, 1981, GPO No. 723-860/752 1-3.
12. Schmidek ME, Layne MA, Lempert BL, Fleming RF. Survey of hearing conservation programs in industry. Cincinnati, Ohio: National Institute for Occupational Safety and Health, 1975; HEW publication no. (NIOSH) 75-178.
13. Ginnold RE. Occupational hearing loss. Workers compensation under State and federal programs. Environmental Protection Agency report no. EPA 550/9-79-101, 1979.
14. U.S. Public Health Service. Promoting health/preventing disease: objectives for the nation. Washington, D.C.: Department of Health and Human Services, 1980;39-43.
15. Lempert BL, Edwards RG. Field investigations of noise reduction afforded by insert-type hearing protectors. Am Ind Hyg Assoc J 1983;12:894-902.

DERMATOLOGICAL CONDITIONS

A worker's skin is directly exposed to the occupational environment and is susceptible to a large number of dermatological injuries and other conditions. Complete data on the extent and cost of dermatological injuries are not available; however, dermatological conditions other than injuries accounted for 37 percent of the 106,100 occupational illnesses recorded in 1983 in the Bureau of Labor Statistics (BLS) Annual Survey of Occupational Injuries and Illnesses (1). Results from the BLS Annual Survey for 1972-1976 indicated that 20-25 percent of all occupational dermatological conditions resulted in lost time from work (average 10-12 lost workdays) (2). Similar data based on workers' compensation claims have been reported from California and South Carolina (3,4). Assuming that only 2-10 percent of cases are actually reported, the annual cost of occupational dermatological conditions resulting from lost worker productivity, medical care, and disability payments may range between $222 million and $1 billion (5,6).

Because 10-15 percent of requests that NIOSH receives for health hazard evaluations involve skin complaints, and because the economic impact of work-related dermatological conditions is substantial, NIOSH has included dermatological conditions on its list of Ten Leading Work-Related Diseases and Injuries in the United States (7).

Dermatological Injuries: Dermatological injuries are usually described as the immediate adverse effects on skin that result from instantaneous trauma or brief exposure to toxic agents involving a single incident in the work environment (1). Skin injuries may constitute 23-35 percent of all injuries (8,9). Thus, based on 4,748,000 injuries of all types, and a full-time worker population of 74,750,000 for 1983 (1), an estimated 1,070,000-1,650,000 dermatological injuries may occur yearly, with an estimated annual rate of skin injury of 1.4-2.2 per 100 full-time workers. The highest percentage of skin injuries are due to lacerations/punctures (82 percent), followed by burns (chemical and other) (14 percent) (8).

Other Dermatological Conditions: Other dermatological conditions, "illnesses of the skin," may also result from exposure to environmental factors or toxic agents associated with employment. However, they usually result from more sustained or cumulative exposures and involve longer intervals between exposure and occurrence of disease. These conditions include contact dermatitis, infection, acne, and skin cancer. Workers' compensation claims data from California suggest that 95 percent of these occupational skin conditions are either contact dermatitis (90 percent) or infections (5 percent) (3). Field investigations in the 1950s showed that at least 80 percent of occupational contact dermatitis cases may be caused by the irritating direct cytotoxic effects of causal agents rather than immunologically mediated allergic reactions (10). The highest number of other occupational skin conditions (23,017) in 1984 occurred in the manufacturing sector; the highest incidence rate (28.5/10,000 full-time workers) involved the combined agriculture/forestry/fishing division. The clinical course for occupational contact dermatitis is relatively poor. In three studies, complete resolution occurred in 25 percent of workers affected; 50 percent improved but had periodic recurrences; and 25 percent developed persistent dermatitis as severe as or worse than the original condition (11-13). Contact dermatitis often necessitates job changes or modifications. Despite these, however, complete resolution may occur in only a limited proportion of cases.

Prevention of Work-Related Dermatological Disorders: The most effective prevention measures are engineering controls that eliminate exposures of the skin to chemical, physical, or mechanical agents through isolation, containment, or redesign of industrial processes. Substitution of less toxic substances through chemical engineering may also be effective (14). Protective clothing should be selected on the basis of resistance to both chemical and physical hazards, as well as on the relative permeabilities to specific chemical exposures. Effective cleaning of skin and clothing is important, but workers should not wash vigorously or excessively with harsh soaps and detergents (15). Barrier creams have been suggested as alternatives, although their effectiveness has not yet been established (16). Prevention strategies should always include education of workers and management.

Expanded activities concerning occupational dermatological conditions include improved methods for surveillance of occupational skin disease and vigorous research in dermatotoxicology to identify preventable risk factors and facilitate effective interventions at early stages.

Reported by Div of Periodic Surveys and Supplementary Data Systems, Office of Occupational Health and Safety Statistics, Bureau of Labor Statistics, US Dept of Labor; Occupational Dermatology Activity, Industrywide Studies Br, Surveillance Br, Div of Surveillance, Hazard Evaluations, and Field Studies, Data Analysis Section, Div of Safety Research, National Institute for Occupational Safety and Health, CDC.

References

1. Bureau of Labor Statistics. Occupational injuries and illnesses in the United States by industry, 1983. Washington DC: US Department of Labor, Bureau of Labor Statistics, June 1985.
2. Wang CL. Occupational skin disease continues to plague industry. Monthly Labor Review 1979;102:17-22.
3. Occupational Disease Statistics Unit, Division of Labor Statistics and Research. Occupational skin disease in California (with special reference to 1977). San Francisco: California Department of Industrial Relations, 1979.
4. Keil JE, Shmunes E. The epidemiology of work-related skin disease in South Carolina. Arch Dermatol 1983;119:650-4.
5. National Institute for Occupational Safety and Health, Office of Health Surveillance and Biometrics, National Occupational Hazard Survey. Pilot study for development of an occupational disease surveillance method. Rockville, Maryland: National Institute for Occupational Safety and Health, 1975, HEW (NIOSH) publication no. 75-162.
6. Mathias CG. The cost of occupational skin disease. Arch Dermatol 1985;121:332-4.
7. CDC. Leading work-related diseases and injuries--United States. MMWR 1983;32:24-6, 32.
8. Bureau of Labor Statistics. Supplementary data system. Unpublished data.
9. Consumer Product Safety Commission. National Electronic Injury Surveillance System. Unpublished data.
10. Schwartz L, Tulipan L, Birmingham DJ. Occupational diseases of the skin. 3rd ed. Philadelphia: Lea and Febiger, 1957.
11. Hellier FF. The prognosis in industrial dermatitis. Br Med J 1958;1:196-8.
12. Burrows D. Prognosis in industrial dermatitis. Br J Dermatol 1972;87:145-8.
13. Fregert S. Occupational dermatitis in a 10-year period. Contact Dermatitis 1975;1:96-107.
14. Adams RM. Allergen replacement in industry. Cutis 1977;20:511-6.
15. Mathias CG. Contact dermatitis: when cleaner is not better. Occup Health Saf 1984;Jan:45-50.
16. Orchard S. Barrier creams. Dermatol Clin 1984;2:619-29.

PSYCHOLOGICAL DISORDERS

There is increasing evidence that an unsatisfactory work environment may contribute to psychological disorders. Studies have shown that factors contributing to an unsatisfactory work environment may include work overload, lack of control over one's work, nonsupportive supervisors or co-workers, limited job opportunities, role ambiguity or conflict, rotating shiftwork, and machine-paced work (1-4). Psychological disorders that can result from such factors may be classified as a) affective disturbances, e.g., anxiety, irritability, b) behavioral problems, e.g., substance abuse, sleep difficulties, c) psychiatric disorders, e.g., neuroses, and d) somatic complaints, e.g., headache, gastrointestinal symptoms. In addition to psychological disorders, stressful working conditions may have a systemic influence, possibly affecting the etiology and/or prognosis of other disease states, as suggested by recent studies of stress-related immunologic suppression (5).

Although databases currently available for determining the extent of work-related psychological disorders are limited, several indicators suggest that these problems impose substantial health and financial costs in the United States. A recent study in California showed that claims for the development of "work-related neuroses" more than doubled during 1980-1982; claims for all other disabling work-related injuries during the same period actually decreased by about one-tenth (6). A study of representative medical claims throughout the country showed that during 1980-1982 claims for "mental stress" that developed gradually, e.g., a chronic problem unrelated to a single traumatic incident or to any physical work-related disorder accounted for about 11 percent of all occupational disease claims (7). Average medical costs and indemnity payments in 1981-1982 for these forms of mental stress actually surpassed the average amounts for other occupational diseases (7). The American Psychiatric Association now lists occupational stress in its Diagnostic and Statistical Manual as a subcategory of the major diagnostic axis of "psychosocial stress" (8).

There are increasing data on the relationship between specific working conditions and psychological disorders. For example, in a questionnaire survey of over 2,000 workers in 23 different occupations, strong occupational differences were found in psychosocial job stressors and in somatic and affective complaints (1). Ratings of boring, repetitive job tasks and role ambiguity were more prominent among several classes of blue-collar workers, e.g., assembly-line workers, fork-lift truck drivers, and machine operators, than among white-collar professionals, e.g., professors and family physicians. The most satisfied occupational groups were physicians, professors, and white-collar supervisors. Groups experiencing the highest levels of job stressors and their resultant ill effects were assemblers and relief workers on machine-paced assembly lines. NIOSH investigators ranked 130 occupations by rate of admission to community mental health centers in Tennessee to determine the relative risk of psychological or stress-related disorders by occupation (9). Heading the list were jobs in health care, service occupations,, and blue-collar factory work--which tend to be characterized by stress-producing conditions such as a lack of control over the job by the worker, repetitive work, shift work, and a responsibility for others. In other studies, workers on night and rotating shifts (including the health-care occupations) reported more disturbances of sleep, altered eating habits, and higher rates of visits to clinics, absences due to sickness, and on-the-job injuries than did those on fixed day shifts (10-12).

Work environments characterized by technological innovation have also been investigated; a major focus has been on office work influenced by the introduction of computers (13,14). Adverse working conditions, e.g., poorer physical environment, reduced job control, and social support tend to be reported more frequently by workers using new technology office equipment such as video display terminals. Some of these conditions have been linked to chronic stress-related disorders (4,15).

Worksite studies by NIOSH have revealed that job stresses may contribute to acute disturbances among groups of workers, including those termed "mass psychogenic illness" (16). The sudden appearance of symptoms, usually in response to some "trigger factor" such as a strange odor, may result in spread of the apparent "illness" throughout the plant, with symptoms such as headaches, dizziness, and nausea. Investigations often fail to detect specific physical or chemical causative agents. However, factors such as heavy work load, strained labor/management relations, and physical discomfort at work may be present and related to the reporting of symptoms.

Emerging trends in technology, the economy, and demographic characteristics of the work force may lead to increased risk for psychological disorders. For example, a 26 percent increase is projected for employment in the health services, an area that may be associated with elevated risk (9,17). Computers and robots are expected to affect 7 million factory jobs and 39 million office jobs (18). According to some forecasters (18), possible consequences may include job displacement, reduced skill requirements, and lower-paying jobs. It has been projected that in the next decade, nine of every ten new jobs will be in the service sector (19). Routine service jobs may not provide the compensation and benefits associated with the more traditional industrial and manufacturing jobs (18). Six of ten new jobs in the next decade will be filled by women (19), and dual job/home role demands and constrained occupational opportunities for women may result in an adverse impact on their mental health.

A prevention strategy for psychological disorders should take into account both the causal mechanisms and the factors that perpetuate these disorders. Work-related psychological disturbances are known to be influenced by both the physical and psychosocial characteristics of given job situations. Moreover, these factors operate in concert with factors unrelated to the job, such as life events;

familial demands and support; and the traits, capacities, and needs of the workers themselves, e.g., personality, age, sex, experience/learning. The interaction of these variables is complex, and the relative influence of each is not thoroughly understood. Nevertheless, approaches to prevent work-related psychological disorders should still be taken using the information currently available.

Stress-reduction techniques, e.g., meditation, biofeedback, muscle relaxation, cognitive restructuring, and anxiety management have been taught to both blue- and white-collar workers in worksite training sessions. Follow-up studies have shown decreases in psychophysiologic activity, e.g., muscle tension and blood pressure levels, and reductions in subjective reports of anxiety, sleep disturbances, and other health complaints with each technique (20). However, improvement in all these parameters persisted less than 3 months after training ended.

Stress management treats only the symptoms of the problem--not the cause. Therefore, efforts to control risk factors at the worksite are also important. Some previously described suggestions for controlling worksite risk factors for psychological disorders are listed below (21). These suggestions appear to have merit for reducing work-related psychological disorders, but further evaluation and study are needed for a complete understanding of their impact.

Work schedule: Design work schedules to avoid conflict with demands and responsibilities unrelated to the job. Schedules for rotating shifts should be stable and predictable, with rotation in a forward (day-to-night) direction.

Participation/control: Allow workers to provide input for decisions or actions affecting their jobs.

Workload: Ensure assignments are compatible with the capabilities and resources of the worker, and allow for recovery from especially demanding physical or mental tasks.

Content: Design tasks to provide meaning, stimulation, a sense of completeness, and an opportunity to use skills.

Roles: Define work roles and responsibilities clearly.

Social environment: Provide opportunities for social interaction, including emotional support and help directly related to one's job.

Future: Avoid ambiguity in matters of job security and career development.

In addition to evaluation of these suggested actions, efforts are needed to advance the understanding of work-related psychological disorders and of methods appropriate for their control, including:

1. Improving the systems for surveillance of psychological disorders in the work force as related to working conditions.
2. Improving research techniques for investigating stressful working conditions and their health consequences.

3. Improving training of occupational health professionals and workers in recognizing stressful workplace conditions and signs of worker stress and in effecting remedial measures.
4. Furthering the development of mental health components in occupational health and safety programs.

Reported by Div of Biomedical and Behavioral Science, National Institute for Occupational Safety and Health, CDC.

References

1. Caplan RD, Cobb S, French JR, Harrison RV, Pinneau SR. Job Demands and Worker Health: main effects and occupational differences. Cincinnati, Ohio: National Institute for Occupational Safety and Health. (DHEW [NIOSH] publication no. 75-160), 1975
2. Holt RR. Occupational stress. In: Goldberger L, Bresnitz S, eds. Handbook of Stress. New York: The Free Press, 1982.
3. Beehr TA, Newman JE. Job stress, employee health, and organizational effectiveness: a facet analysis, model, and literature review. Personnel Psychology 1978;31:665-99.
4. Karasek RA. Job demands, job decision latitude, and mental strain. Journal of Occupational Behavior 1979;24:285-307.
5. Kiecolt-Glaser JK. Stress and the immune function. In: Measures of job stress: a research methodology workshop. Workshop sponsored by NIOSH, New Orleans, Louisiana, 1985.
6. California Workers Compensation Bulletin, April 20, 1983.
7. National Council on Compensation Insurance Emotional stress in the workplace--new legal rights in the eighties. New York 1985.
8. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders, 3rd ed. Washington, DC: American Psychiatric Association, 1980.
9. Colligan MJ, Smith MJ, Hurrell JJ Jr. Occupational incidence rates of mental health disorders. J Human Stress 1977;3:34-9.
10. Smith MJ, Colligan MJ, Frockt IJ, Tasto DL. Occupational injury rates among nurses as a function of shift schedule. Journal of Safety Research 1979;11:181-7.
11. Colligan MJ, Frockt IJ, Tasto DL. Frequency of worksite clinic visits and sickness absence among nurses as a function of shift. Applied Ergonomics 1979;10:79-86.
12. Smith MJ, Colligan MJ, Tasto DL. Health and safety consequences of shift work in the food processing industry. Ergonomics 1982;25:133-44.
13. Smith MJ, Cohen BG, Stammerjohn LW. An investigation of health complaints and job stress in video display operations. Human Factors 1981;23:387-400.
14. Sauter S, Gottlieb M, Jones C, Dodson V, Rohrer K. Job and health implications of VDT use: initial results of the Wisconsin-NIOSH study. Communications of the ACM 1983;26:784-94.
15. House JS, Wells JA. Occupational stress, social support, and health. In: McLean A, Black G, Colligan M, eds. Reducing Occupational Stress:

Proceedings of a Conference. Washington, DC, 1978. (DHEW publication no. 78-140.)

16. Schmitt N, Colligan MJ, Fitzgerald M. Unexplained physical symptoms in eight organizations: individual and organizational analyses. Journal of Occupational Psychology 1980;53:305-17.
17. Silvestri GT, Lukasiewicz JM. Occupational employment projections: the 1984-95 outlook. Monthly Labor Review, November 1985:42-57.
18. Bezold C, Carlson RJ, Peck JC. The future of work and health. Dover, Massachusetts Auburn House, 1986.
19. Bureau of Labor Statistics. Bureau of Labor Statistics News. Washington, DC: Department of Labor, November 1985.
20. Murphy LR. Occupational stress management: review and appraisal. Journal of Occupational Psychology.
21. Levi L. Preventing Work Stress. Reading, Massachusetts: Addison-Wesley, 1981.

NIOSH PROJECTS BY PROGRAM AREAS

Occupational Lung Diseases

Musculoskeletal Injuries

Occupational Cancers

Severe Occupational Traumatic Injuries

Occupational Cardiovascular Diseases

Disorders of Reproduction

Neurotoxic Disorders

Noise-Induced Hearing Loss

Dermatological Conditions

Psychological Disorders

Assistance Requests

Administration

Other

OCCUPATIONAL LUNG DISEASES

EVALUATION OF MESOTHELIOMA PRODUCTION BY ASBESTOS SUBSTITUTES

Purpose: This project will evaluate the toxicity/carcinogenicity of two modified chrysotile asbestos products which have been proposed as safe substitutes for asbestos through intrapleural implantation in rats. The toxicity/carcinogenicity of these substitute materials will be evaluated and compared to untreated asbestos materials.

DBBS, Stanley F. Platek
CAN 376 Dates: 10/84-09/91

CONTROL TECHNOLOGY FOR NIOSH SURVEILLANCE ACTIVITIES

Purpose: This project will disseminate control information directly to plants with cases of silicosis, and will develop guidelines for State follow-back of health hazards.

DPSE, Dennis M. O'Brien
CAN 404 Dates: 10/88-09/91

DUST CONTROL FOR FALLING SOLIDS

Purpose: Free-falling powders generate dust. The physical parameters of the free-fall (drop height, mass flow rate, bulk density of the powder) are affected by equipment design. The project will investigate how these parameters affect dust generation. Guidelines will be developed for equipment designers to predict and minimize the generation of dust.

DPSE, William A. Heitbrink
CAN 406 Dates: 01/86-06/90

ASBESTOS REMOVAL CONTROL TECHNOLOGY ASSESSMENT

Purpose: This work evaluates glove bags, a control to prevent asbestos release into the work environment during removal of pipe lagging. Limitations of this control and ways to overcome them are identified and will be disseminated to personnel doing asbestos abatement work.

DPSE, Phillip A. Froehlich
CAN 408 Dates: 10/84-06/90

IMPLEMENT ASBESTOS CONTROLS DURING BRAKE SHOE REPLACEMENT

Purpose: This project will disseminate NIOSH evaluated asbestos controls for the brake shoe replacement industry through the use of technology transfer agents in the Ohio community college system.

DPSE, Theodore F. Schoenborn
CAN 409 Dates: 01/88-09/92

ASBESTOS ANALYSIS SURVEILLANCE PROGRAM

Purpose: This project represents a cooperative arrangement with AIHA to establish an asbestos analyst registry (AAR). The objective of the AAR is to improve the quality of analyses done on-site during asbestos clearance operations.

DPSE, Martin T. Abell
CAN 412 Dates: 10/86-09/90

OCCUPATIONAL LUNG DISEASES

ANALYTICAL METHODS FOR INORGANIC SUBSTANCES

Purpose: In response to needs arising from NIOSH prevention strategies, analytical methods for inorganic substances in air or other matrices will be developed. Also, new analytical chemistry techniques will be evaluated for application to industrial hygiene sampling and analytical needs.

DPSE, John V. Crable
CAN 413 Dates: 01/86-C

HALOGEN GASES S/A METHODS

Purpose: Development of new monitoring methods for toxic oxidizing gases will aid in preventing occupational lung diseases, neurotoxic disorders and dermatological conditions. The development of a sampler capable of collecting all the free halogen gases and an analytical technique capable of separating and measuring each halogen are proposed.

DPSE, Mary E. Cassinelli
CAN 414 Dates: 10/87-09/90

TECHNOLOGY TRANSFER FOR DPSE PROJECTS

Purpose: This project will transfer the technology developed in DPSE so that control and monitoring innovations are widely available for adoption and patentable discoveries are commercialized to ensure the widest possible usage.

DPSE, Theodore F. Schoenborn
CAN 416 Dates: 10/87-C

CONTROL OF AMMONIA RELEASES IN AGRICULTURAL APPLICATIONS.

Purpose: This project will identify and recommend preventive measures for ammonia releases in agricultural applications.

DPSE, Michael G. Gressel
CAN 423 Dates: 10/89-09/91

HHE ANALYTICAL CHEMISTRY SUPPORT

Purpose: Provides timely analytical chemistry services to the HHE program by assuring rapid turnaround of requests for sample analyses and method development. It is projected that 6900 HHE field samples will be analyzed and 4 sampling/analytical methods will be developed or modified under this project during FY 90.

DPSE, John L. Holtz
CAN 425 Dates: 10/85-C

MINING AND RESPIRATORY DISEASE RESEARCH ANALYTICAL SUPPORT

Purpose: This project will provide analytical chemistry support to mining investigations, respiratory disease studies, and safety research. Analytical chemistry support will be given to studies of fibrous minerals combined with other mineral dust. Analytical support to NOHS mining will be completed during FY 90.

DPSE, Donald D. Dollberg
CAN 426 Dates: 10/84-C

OCCUPATIONAL LUNG DISEASES

PILOT STUDY; EVALUATION OF PROCESS CONTAINMENT FOR BIOAEROSOLS

Purpose: This project will identify improved methods of evaluating bioprocess containment and identify specific equipment for evaluation.

DPSE, Paul A. Jensen
CAN 429 Dates: 10/86-09/91

A METHOD FOR SAMPLING AND ANALYSIS OF INDOOR AIR FOR ORGANIC COMPOUNDS

Purpose: The sampling and analytical method developed will provide data on worker exposure to vapor-phase organic compounds found in indoor air. This data will be used by the industrial hygiene community to study health effects reported in exposed populations. Results of these studies will provide recommendations for exposure reduction.

DPSE, Eugene R. Kennedy
CAN 430 Dates: 10/89-09/92

A NATIONAL CONSTRUCTION INDUSTRY CONTROL TECHNOLOGY DATABASE

Purpose: This project will evaluate the feasibility of a national database, potentially including physical, biological, chemical agents, and chronic trauma.

DPSE, James Gideon
CAN 434 Dates: 10/89-C

ANALYTICAL METHODS FOR ORGANIC COMPOUNDS

Purpose: Analytical methods for organic compounds in workplace air and other matrices of industrial hygiene interest will be developed. New analytical-chemistry techniques will be evaluated for application to industrial hygiene problems. This will advance the state-of-the-art of identifying and quantifying worker exposure to toxic chemicals.

DPSE, Robert A. Lunsford
CAN 437 Dates: 10/82-C

DETERMINATION OF FORMALDEHYDE CONTENT OF AIRBORNE DUST

Purpose: Provide data on exposure of workers to formaldehyde containing dust through sampling and analytical method developed. This information will be used to study excess of cancer in exposed populations. These studies will provide recommendations for exposure reduction and subsequent reduction of disease.

DPSE, Eugene R. Kennedy
CAN 439 Dates: 10/88-06/90

REVISION OF THE NIOSH MANUAL OF ANALYTICAL METHODS

Purpose: This project provides a collection of current NIOSH analytical methods for use in health hazard evaluations, industry wide studies, and control technology assessments.

DPSE, Peter M. Eller
CAN 445 Dates: 10/82-C

OCCUPATIONAL LUNG DISEASES

ANALYTICAL METHODS FOR ASBESTOS FIBERS

Purpose: The project will investigate methods 7400 and 7402 and suggest improvements if needed. Automated fiber counting and standard analytical techniques will be evaluated for interferences. Techniques for preparing specific size fractions of asbestos fibers will be evaluated.

DPSE, Paul A. Baron
CAN 448 Dates: 10/84-09/90

PARTICLE SAMPLER PERFORMANCE TESTING

Purpose: This goal will be accomplished by producing sampler performance criteria and associated testing. Freedom from instrumentation specification will provide the flexibility necessary for the development of new samplers. Flexibility with no compromise of performance is expected because of new instrumentation available.

DPSE, David L. Bartley
CAN 455 Dates: 10/89-09/92

QUALITY ASSURANCE (EXTERNAL)

Purpose: NIOSH will continue to rate laboratories in the PAT program, a joint project of NIOSH and AIHA. Proficiency ratings are based on the analytical results reported for quality audit samples that include carcinogens (e.g., asbestos and benzene). In addition, laboratory performance will be documented in publications.

DPSE, Jensen H. Groff
CAN 458 Dates: 10/82-C

MAINTENANCE AND CALIBRATION

Purpose: This project will: 1) provide repair, calibration of field and direct reading equipment (DPSE ECTB, DSHEFS IWSB, DTMD, and some State labs); 2) provide electronic repair and fabrication support for direct-reading instrument development; 3) complete final version of a system for wireless transmission of environmental data in the workplace.

DPSE, Ronald Kovein
CAN 459 Dates: 10/82-C

DEV. OF PREDICTIVE MODELS FOR DETERMINING CONTROL EFFECTIVENESS

Purpose: This project develops predictive models for local exhaust ventilation systems used to control sources of contaminants. The end product will be a series of models which help the designer to design effective control systems applicable to all disease categories associated with airborne contaminants.

DPSE, Mazen Y. Anastas
CAN 494 Dates: 10/85-12/89

GAS AND VAPOR MEASUREMENT TECHNIQUES

Purpose: The photo-optical study may lead to a very versatile system for surveillance of airborne pollutants in the workplace, producing real-time mapping of pollutants, improving estimates of personal exposure, and evaluating effectiveness of control methods.

DPSE, Harley V. Piltingsrud
CAN 496 Dates: 10/84-09/90

OCCUPATIONAL LUNG DISEASES

DEVELOPMENT OF EMISSION CONTROLS FOR LASER PROCESSES

Purpose: This project will develop guidelines for the control of gaseous and particulate emissions from industrial and medical processes involving lasers. Emissions from processes will be identified and quantified to assess their potential hazard. Smoke evacuators and other controls will be studied.

DPSE, Jerome P. Smith
CAN 843 Dates: 10/88-01/90

PULMONARY RESPONSE TO COTTON DUST

Purpose: This project will validate and extend an animal model for byssinosis, develop more sensitive measurements of human response, and determine the effectiveness of various treatments of cotton in removing the etiologic agent.

DRDS, Vincent Castranova
CAN 102 Dates: 10/88-09/91

ENDOTOXIN DETECTION IN COTTON DUST

Purpose: Knowledge related to which endotoxins are the most toxic will lead to standard development based on measurement of precise biologic/etiologic agents. Relative toxicity of the most likely etiologic agent (endotoxin) will be studied and defined so that intervention techniques can be applied at cultivation or processing.

DRDS, Stephen A. Olenchock
CAN 104 Dates: 10/88-09/91

COMPARATIVE RESEARCH IN ANALYTICAL PATHOLOGY

Purpose: The results obtained from the autopsy program and related DRDS research project support will aid in evaluating the effectiveness of the coal mine dust standard.

DRDS, Val Vallyathan
CAN 105 Dates: 10/71-C

INDUCTION OF DNA-ADDUCT IN THE LUNGS BY INDUSTRIAL CHEMICALS

Purpose: This project will establish and evaluate the efficacy of the lung cell DNA adduct analysis, a molecular methodology, for the detection and assessment of the potential carcinogenic hazards of chemicals and complex mixtures to which workers are exposed.

DRDS, Wen-Zong Whong
CAN 106 Dates: 10/89-09/92

EFFECT OF SILICA EXPOSURE ON THE LUNG: BIOCHEM/PATH STUDIES

Purpose: Lung cells will be exposed to freshly cleared or aged silica in vitro and in vivo and cellular reactions to these exposures will be compared to determine the relationship between surface characteristics of dust and its biological reactivity.

DRDS, Vincent Castranova
CAN 113 Dates: 10/89-09/92

OCCUPATIONAL LUNG DISEASES

ASSESSMENT OF THE CARCINOGENIC POTENTIAL OF SELECTED DUSTS

Purpose: The project will determine whether silica, talc, and man-made fibers can cause cell transformation, and oncogene expression in mammalian cells.

DRDS, Tong-Man Ong
CAN 116 Dates: 10/89-09/92

OCCUPATIONAL ASTHMA AND THE ROLE OF AIRWAY EPITHELIUM

Purpose: This project will develop and evaluate animal in vitro models to detect early cellular changes in airway epithelium and smooth muscle associated with exposure to selected irritant vapors. It will help identify early signs of disease.

DRDS, Jeffrey S. Fedan
CAN 119 Dates: 02/87-09/90

ANIMAL AND EXPOSURE FACILITY SUPPORT FOR DRDS

Purpose: This project provides animals to NIOSH researchers for the purposes of defining etiologic agents, animal models of ORD, pathogenetic and defense mechanisms and naturally occurring variability in exposures which cause or influence occupational lung disease.

DRDS, Kenneth C. Weber
CAN 123 Dates: 10/80-C

VALIDATION STUDIES OF IN SITU ASSAY SYSTEMS IN OCCUPATIONAL SETTING

Purpose: This project will develop and characterize a biological assay system to provide methods for the detection and monitoring of genotoxic agents and potential carcinogens in workplace environment, and for the detection and assessment of potential health hazards to workers.

DRDS, Tong-Man Ong
CAN 124 Dates: 07/86-09/92

AGRICULTURE: CHRONIC BRONCHITIS STUDIES

Purpose: This project will address the isolation, characterization and description of the potentially toxic agents in agricultural (organic) dusts. The evaluation of the effects of these agents in animals and humans will provide the basis for the development of appropriate prevention strategies.

DRDS, Stephen A. Olenchock
CAN 126 Dates: 01/87-09/90

CENTERS FOR AGRICULTURAL RESEARCH, EDUCATION AND DISEASE AND INJURY

Purpose: The Centers' program, through cooperative agreement with several facilities, will expand existing programs and establish new model programs in agricultural health and safety.

DRDS, Stephen A. Olenchock
CAN 130 Dates: 10/89-02/93

OCCUPATIONAL LUNG DISEASES

NHANES III SUPPORT

Purpose: This project will provide support to the respiratory disease part of NHANES. Pulmonary function equipment will be maintained, training provided, and quality control performed to insure a uniform approach to data collection.

DRDS, John L. Hankinson
CAN 135 Dates: 10/87-09/95

PREVENTION OF SILICOSIS IN FOUNDRY WORKERS

Purpose: This project will provide support to a State health department (Ohio) in the development of a model program for surveillance and prevention of silicosis in foundry workers.

DRDS, Thomas B. Richards
CAN 137 Dates: 03/88-09/90

MICROBIAL EXPOSURES IN AGRICULTURE

Purpose: This project will provide data on the quantitative and qualitative distribution of microorganisms in respirable dust associated with a variety of agricultural processes. Such data are needed to understand the mechanism of acute febrile illness associated with exposure, and to develop appropriate intervention strategies.

DRDS, Stephen A. Olenchock
CAN 147 Dates: 10/89-02/93

INFLAMMATORY AGENTS IN AGRICULTURAL DUSTS

Purpose: This project will evaluate the inflammatory potential of, and the inflammatory reaction to, selected agricultural dusts. This information will provide a basis for determining the types of dusts likely to produce pulmonary inflammation.

DRDS, Daniel M. Lewis
CAN 148 Dates: 10/89-09/92

ROLE OF FUNGAL SPORES IN ORGANIC DUST TOXIC SYNDROME (ODTS)

Purpose: This project will help to provide an understanding of the role of fungal spores in the etiology of ODTS through isolation of pure preparations of fungal spores, and through investigations of the effect of those spores on cellular components of the immune system.

DRDS, William G. Sorenson
CAN 150 Dates: 10/89-02/93

EMERGING TECHNOLOGY FOR RESPIRATORY DISEASE EVALUATIONS

Purpose: This project will refine current technologies and develop new tools to allow more efficient and sensitive detection of occupational respiratory disease. Field studies of airway responsiveness permit identification of risk factors for the sensitization of workers.

DRDS, John L. Hankinson
CAN 152 Dates: 10/88-09/91

OCCUPATIONAL LUNG DISEASES

EVALUATION OF ROLE OF INTERFERON SYSTEM IN OCC ASTHMA ASSOC W/ AG DUST

Purpose: This project will determine the effects of in vitro exposure to grain dusts, dust extracts, and microbial agents on the production of interferon by alveolar type II cells and macrophages. Dose-response and time-course studies will be conducted.

DRDS, Nicholas Hahon
CAN 154 Dates: 10/89-09/92

STATE-BASED SURVEILLANCE: MEDICAL TECHNICAL SUPPORT

Purpose: This project provides medical technical support to the Sentinel Event Notification System for Occupational Risks (SENSOR) and to States developing surveillance systems for occupational respiratory diseases.

DRDS, Thomas B. Richards
CAN 155 Dates: 10/84-C

PNEUMOCONIOSIS X-RAY INTERPRETATION USING COMPUTED IMAGE MODIFICATION

Purpose: Effective research and medical surveillance require accurate detection methods, primarily x-ray interpretation. This project is designed to improve both the consistency and the accuracy of x-ray interpretation, and improve coal and asbestos research/surveillance, by implementing new processing technology in the reading of chest x-rays.

DRDS, Thomas K. Hodous
CAN 156 Dates: 10/87-09/90

AGRICULTURAL LUNG DISEASE PROGRAM PEER REVIEW: TECHNICAL SUPPORT

Purpose: This project will coordinate the program peer review effort.

DRDS, Stephen A. Olenchock
CAN 157 Dates: 10/89-09/90

EMERGING PROBLEMS IN OCCUPATIONAL RESPIRATORY DISEASE

Purpose: This project will relate Chinese/U.S. dust and radiographic change measurements.

DRDS, Frank J. Hearl
CAN 158 Dates: 10/85-09/90

SILICOSIS SURVEILLANCE: MORTALITY AND MORBIDITY TRENDS

Purpose: This project will explore and analyze existing data sources to develop estimates of trends in national mortality and morbidity from silicosis and respiratory conditions included on the list of NIOSH ten leading work-related disease and injuries (other than coal workers' pneumoconiosis).

DRDS, Thomas B. Richards
CAN 159 Dates: 11/87-09/91

OCCUPATIONAL LUNG DISEASES

DEVELOPMENT OF BIOASSAYS: IDENTIFY HEALTH RISKS OF ASBESTOS SUBSTITUTES

Purpose: This project will develop methodologies allowing assessment of relative toxicities of fibers having identical chemistry but different dimensions, and fibers having similar morphology but different chemistry.

DRDS, Vincent Castranova
CAN 160 Dates: 10/89-09/92

SURVEILLANCE OF LUNG DISEASE AGENTS IN SMALL BUSINESSES

Purpose: This project will characterize exposures to lung disease agents, safety hazards, and use of engineering controls and protective equipment in selected potentially hazardous small businesses.

DRDS, Paul Hewett
CAN 162 Dates: 11/87-09/91

AGRICULTURAL DUST: ELUCIDATION DISEASE MECH. W/ANIMAL MODEL, BIOMARKERS

Purpose: This project will generate aerosols of selected organic dusts, and expose guinea pigs by inhalation. The appearance of biomarkers in the lavage fluid will be monitored, and various pulmonary responses (lavagable macrophages and leukocytes, activity of these phagocytes, lung water, airway closure and breathing rate) will be measured.

DRDS, David G. Frazer
CAN 163 Dates: 10/89-09/92

NATIONAL OCCUPATIONAL HEALTH SURVEY OF MINING

Purpose: This project will collect data on the mining work force and their potential exposures to fibers, asbestos, silica, and various chemical exposure agents. The data will identify worker groups, jobs, and industries at risk from exposure to toxic substances or harmful physical agents.

DRDS, Dennis W. Groce
CAN 164 Dates: 10/82-09/91

AGRICULTURAL DUSTS: ANIMAL MODELS OF ASTHMA

Purpose: The animal model will mirror worker pulmonary response to grain and wood dust inhalation, as well as dust-induced airway hyperreactivity. Animal responses will be compared to published human responses. The toxicities of the dusts will be assayed biologically with proven and new in vitro airways preparations

DRDS, Jeffrey S. Fedan
CAN 165 Dates: 10/89-09/92

EFFECTIVE SILICA INDICES FOR RESPIRABLE MINERAL DUST

Purpose: This project will develop methods determining surface composition of respirable quartz distinguishing biologically available and unavailable quartz surface.

DRDS, William E. Wallace
CAN 167 Dates: 10/84-09/91

OCCUPATIONAL LUNG DISEASES

NORTH CAROLINA DUSTY TRADES FILE

Purpose: This project will estimate the relationship between silica, silicosis, and lung cancer in silica exposed workers and between chrysotile asbestos and cancer in textile workers employed in the North Carolina dusty trades industries.

DRDS, Harlan E. Amandus
CAN 172 Dates: 10/84-09/90

ENVIRONMENTAL HAZARD SURVEILLANCE

Purpose: This project will collect, analyze, and disseminate exposure data of dust contaminants in mining and manufacturing industries. High risk occupations and industries will be determined.

DRDS, A.L. Dieffenback
CAN 173 Dates: 10/82-C

CWP SURVEILLANCE SUMMARY REPORTS

Purpose: This project will prepare and report summary statistics on CWP mortality and morbidity from NIOSH mandated programs which are operated by DRDS.

DRDS, Rochelle B. Althouse
CAN 174 Dates: 10/89-C

TECHNICAL AND STATISTICAL SUPPORT

Purpose: This project will design and analyze data for other branches in DRDS. Under this project, statisticians will also give statistical advice to other investigators, review protocols and manuscripts, and assist in writing manuscripts and final reports.

DRDS, Martin R. Petersen
CAN 176 Dates: 10/89-C

SILICOSIS AND CANCER IN METAL MINERS

Purpose: The association between silica, silicosis, and cancer will be evaluated in a cohort of metal miners.

DRDS, Harlan E. Amandus
CAN 177 Dates: 10/89-09/93

RADIOLOGICAL/PATHOLOGICAL CORRELATION IN CWP

Purpose: The amount and type of pathological abnormality will be determined in lungs of a large number of autopsy cases. Correlation will be made between these findings and radiological abnormalities. The results will provide important information on the extent of pathological disease in coal miners in general.

DRDS, Michael D. Attfield
CAN 178 Dates: 10/89-09/92

OCCUPATIONAL LUNG DISEASES

SILICOSIS IN SURFACE MINERS EXAMINED IN SURVEILLANCE PROGRAM

Purpose: This project will provide for the collection of detailed work histories and smoking histories of surface coal miners having pneumoconiosis and a group of matched controls. A case-control analysis will be used to determine whether or not an association exists between silicosis and high risk jobs such as drillers and bulldozer operators.

DRDS, Harlan E. Amandus
CAN 180 Dates: 10/89-09/92

MEDICAL FIELD TEAM TECHNICAL SUPPORT

Purpose: This project will provide technical support in the collection of data from actual work sites throughout the country to enable an accurate determination of the prevalence or progression of respiratory occupational health problems, and provide in-house technical support services.

DRDS, Gregory C. Spransy
CAN 182 Dates: 10/87-C

NATIONAL STUDY OF CWP AND RELATED RESEARCH

Purpose: With the NSCWP, trends in exposure to coal mine dusts (dust level, composition, size distribution, and mining methods) will be identified and their relationship to lung diseases will be determined. In addition, the effectiveness of the current x-ray surveillance program will be determined.

DRDS, Michael D. Attfield
CAN 183 Dates: 10/83-09/90

IDENTIFICATION OF LONGWALL MINERS FOR ASSESSMENT/PREVENTION OF CWP

Purpose: This project will assist in determining the effectiveness of the coal dust standard in preventing occupational lung disease in miners potentially at risk of overexposure to coal mine dust due to their work in longwall mining. This will be accomplished by maintaining a data base of longwall miners and periodically examining their medical data.

DRDS, Joseph Costello
CAN 184 Dates: 10/89-C

COAL MINER MEDICAL SURVEILLANCE: MORTALITY AND MORBIDITY TRENDS

Purpose: This project will explore and analyze previously untapped existing data sources to develop estimates of trends in mortality and morbidity from CWP.

DRDS, Rochelle B. Althouse
CAN 185 Dates: 11/87-09/91

OCCUPATIONAL RESPIRATORY DISEASE SURVEILLANCE IN AGRICULTURE

Purpose: This project will support the NIOSH program of occupational disease surveillance by analyzing existing secondary data sources to identify high risk occupations (by agricultural sector/geographic region, etc.) for further evaluation, research, or public health intervention.

DRDS, Rochelle B. Althouse
CAN 186 Dates: 10/89-C

OCCUPATIONAL LUNG DISEASES

ENDOTOXIN EXPOSURE/ACUTE RESPIRATORY EFFECTS IN AGRICULTURAL WORKERS

Purpose: This project will analyze data previously collected by NIOSH, in order to evaluate the exposure-response relationship between acute respiratory effects and inhalational exposure to airborne endotoxin in agricultural workers.

DRDS, Robert M. Castellan
CAN 187 Dates: 10/89-03/92

SILICOSIS RISK IN THE CONSTRUCTION INDUSTRY

Purpose: This project will provide data to estimate the prevalence and the potential risk of silicosis in selected segments of the construction industry.

DRDS, Martin R. Petersen
CAN 188 Dates: 10/89-03/94

HEALTH RISK OF EXPOSURE TO ASBESTOS SUBSTITUTES IN INSULATION WORK

Purpose: This project will provide data to estimate the prevalence of dust-induced disease in insulation workers.

DRDS, Harlan E. Amandus
CAN 189 Dates: 10/89-09/92

FARM FAMILY SURVEY: RESPIRATORY DISEASE TECHNICAL SUPPORT

Purpose: This project will provide technical support, for occupational respiratory disease activities, to the U.S. Farm Family Health and Hazard Survey.

DRDS, Robert M. Castellan
CAN 190 Dates: 10/89-C

MEDICAL TECHNICAL SUPPORT

Purpose: By providing medical technical support, this project enables other research projects as well as health hazards evaluations to collect high quality data for use in their respective studies.

DRDS, John L. Hankinson
CAN 202 Dates: 10/87-C

BYSSINOSIS PREVENTION

Purpose: This project provides technical consultation and occupational health leadership to government/industry/union task force for byssinosis prevention. It includes analysis of existing data, preparation of both NIOSH and task force reports, review of draft reports/research proposals from task force members, and planning collaborative task force research.

DRDS, Robert M. Castellan
CAN 205 Dates: 10/81-09/91

OCCUPATIONAL LUNG DISEASES

AIRWAYS DISEASE IN MINERS

Purpose: This project will identify environmental and constitutional risk factors which predict the development of severe lung impairment in coal miners and possibly in other dusty occupations.

DRDS, Edward L. Petsonk
CAN 212 Dates: 10/89-09/92

OCCUPATIONAL ASTHMA IDENTIFICATION METHODS

Purpose: This project will develop simple, objective, standardized methods and criteria for identifying cases of occupational asthma. This will encourage both case reporting by physicians and surveillance efforts by State health departments.

DRDS, Edward L. Petsonk
CAN 213 Dates: 10/89-09/93

ANALYSIS OF DATA FROM AN EGYPTIAN SILICA STUDY: USAID

Purpose: This project provides technical support to Egypt in determining the prevalence of silicosis and exposure-response relationships in Egyptian industries.

DRDS, Martin R. Petersen
CAN 214 Dates: 10/86-05/91

AGRICULTURAL DUSTS: FIELD-BASED EVALUATION-EXPOSURE ACUTE RESP ILLNESS

Purpose: This project will provide information on exposure and disease relationships to be used for prevention strategies.

DRDS, John E. Parker
CAN 215 Dates: 10/89-C

RURAL HOSPITAL NURSES: RESPIRATORY DISEASE TECHNICAL SUPPORT

Purpose: This project provides technical support on occupational respiratory diseases to the NIOSH Rural Hospital Nurses Program.

DRDS, Elizabeth B. Knutti
CAN 216 Dates: 10/89-C

EVALUATION/REHABILITATION OF OCCUPATIONAL RESP. DISEASE INJURY

Purpose: This project will, through the development and implementation of a cooperative agreement with a major medical center, develop a model evaluation and rehabilitation program for occupational lung diseases and musculoskeletal disorders.

DRDS, John E. Parker
CAN 217 Dates: 10/89-09/93

OCCUPATIONAL LUNG DISEASES

HAZARD SURVEILLANCE IN THE CONSTRUCTION INDUSTRY

Purpose: This project will define the current respiratory exposures in various segments of the construction industry and increase NIOSH's ability to respond to requests for Health Hazard Evaluations, in this industry, in a timely manner.

DRDS, John E. Parker
CAN 218 Dates: 10/89-09/92

INDUSTRIAL HYGIENE TECHNICAL SUPPORT

Purpose: This project quantifies levels of exposure to toxins, allergens, pathogens, hazardous dusts, and carcinogens. It provides services, environmental sampling, and review/comment on draft NIOSH documents.

DRDS, Jerry L. Clere
CAN 223 Dates: 10/82-C

BIAS IN PARTICULATE EXPOSURE SAMPLING DEVICES

Purpose: This project will conduct a theoretical analysis of the difference (bias) between deposited particulate (dose) and measured particulate (exposure) for a range of ideal particle size distributions. Field particle size distribution data will be collected in order to assess bias using actual distributions.

DRDS, Michael A. McCawley
CAN 224 Dates: 10/89-09/90

FIBER TOXICITY: SURFACE PROPERTIES AND ANALYSIS

Purpose: This project will use physical methods to reveal the surface properties of fibers, including surface and bulk composition, dimensions and surface area, using Auger, XPS, and EDX spectroscopy and bet surface analysis; results will be correlated with the surface toxicity of native and surfactant-treated mineral fibers.

DRDS, William E. Wallace
CAN 225 Dates: 10/89-09/92

ENVIRONMENTAL SURVEILLANCE OF SMALL COAL MINES

Purpose: This project will examine and report on occupational health hazards found in small coal mines (mines with less than 20 miners).

DRDS, Alwin L. Dieffenbach
CAN 226 Dates: 10/89-09/90

PILOT ENVIRONMENTAL SURVEILLANCE OF ENDOTOXIN AT SELECTED COTTON GINS

Purpose: This project will demonstrate the feasibility of determining the distribution of endotoxins in the U.S. cotton crop using air samples of dusts from gins at various U.S. locations, with comparison to endotoxin levels found in samples taken at USDA cotton classing offices.

DRDS, Shib S. Bajpayee
CAN 227 Dates: 10/89-09/92

OCCUPATIONAL LUNG DISEASES

EVALUATION SUPPORT TO NIOSH COALWORKERS' SURVEILLANCE PROGRAM

Purpose: By improving the surveillance program, more accurate data will be generated upon which to make public health decisions.

DRDS, Thomas K. Hodous
CAN 228 Dates: 10/89-09/91

"B" READER PROGRAM: EVALUATION AND MODIFICATION

Purpose: The nationally used "B" reader examinations will be professionally reevaluated in light of our improved understanding about pleural disease and pneumoconiosis. Recommended program improvements will be evaluated and initiated as indicated.

DRDS, Thomas K. Hodous
CAN 229 Dates: 10/89-09/92

COMPUTER SUPPORT

Purpose: Computer support in terms of parklawn computer center charges, data entry, and programming support will be provided to all DRDS projects.

DRDS, John L. Hankinson
CAN 232 Dates: 10/87-C

AUTOPSY PROGRAM: PROGRAM OPERATION

Purpose: This project will provide data for assessing the effectiveness of the coal mine dust standard and provide autopsy services in accordance with PL 191-173, Section 203(d), amended.

DRDS, Mitzie L. Martin
CAN 233 Dates: 05/71-C

COAL MINER MEDICAL SURVEILLANCE: RECEIVING CENTER OPERATION

Purpose: This project carries out multiple functions in collecting, entering, and filing valid x-ray data on coal miners which then may be analyzed for surveillance and other purposes.

DRDS, Mitzie L. Martin
CAN 235 Dates: 08/70-C

DIESEL PARTICULATE MEASUREMENTS

Purpose: In this project, dust from both dieselized and non-dieselized coal mines will be collected in a size selective sampler. Samples will be analyzed using standard in-site mutagenicity assays and using surfactant prepared dusts.

DRDS, Rebecca Stanevich
CAN 236 Dates: 10/88-09/91

OCCUPATIONAL LUNG DISEASES

RESPIRABLE GENOTOXIC PARTICULATE EXPOSURE MEASUREMENT MONITORING

Purpose: This project will develop and apply methods to collect and measure the genotoxic dose associated with respirable particulate exposures in a manner predictive of their fate in the lung.

DRDS, William E. Wallace
CAN 237 Dates: 10/88-09/92

WHERE'S THE ENDOTOXIN?

Purpose: This project will design, build, and test biologically and analytically relevant endotoxin samplers.

DRDS, William G. Jones
CAN 238 Dates: 10/88-09/91

SILICA EXPOSURES OF NSCWP SELECTED MINES

Purpose: This project will determine the variability of silica levels based on increased MSHA analysis for silica in a group of selected coal mines.

DRDS, Michael A. McCawley
CAN 239 Dates: 10/88-09/90

MAN-MADE MINERAL FIBERS POSITION PAPER

Purpose: This project will provide a critical evaluation of information concerning occupational exposure to man-made mineral fibers. The evaluation will be used to develop a position paper that will provide a recommendation to OD, NIOSH, concerning the need to develop a man-made mineral fibers document (e.g., CD, CIB).

DSDTT, Clayton B. Doak
CAN 088 Dates: 10/89-09/90

ACRYLAMIDE-CURRENT INTELLIGENCE BULLETIN (CIB)

Purpose: This project will provide a critical evaluation of the health risks associated with exposure to acrylamide. This evaluation will be used to develop a CIB that will report new data concerning the potential carcinogenic and reproductive effects of acrylamide.

DSDTT, Vlasta B. Molak
CAN 089 Dates: 10/89-09/90

HEALTH SAFETY HAZARDS AMONG COSMETOLOGISTS ALERT

Purpose: This project will develop an alert in conjunction with DSHEFS that identifies the health and safety hazards associated with the cosmetology profession. The alert will make recommendations for preventing such hazards.

DSDTT, Laurence D. Reed
CAN 109 Dates: 10/89-09/91

OCCUPATIONAL LUNG DISEASES

EXPOSURE TO AIR CONTAMINANTS DURING LASER SURGERY ALERT

Purpose: This project will develop an alert in conjunction with DSHEFS that identifies the health hazards associated with laser surgery. The alert will make recommendations for preventing such hazards.

DSDTT, Laurence D. Reed
CAN 110 Dates: 10/89-09/91

SURFACE COAL MINERS CRITERIA DOCUMENT

Purpose: This project will provide a critical evaluation of information concerning occupational lung disease in surface coal miners. The evaluation will be used to develop a criteria document which will provide criteria for a recommended standard for the prevention of occupational lung diseases in surface coal miners.

DSDTT, Clayton Doak/Henry Chan
CAN 136 Dates: 10/89-09/91

ACCESS TO OSHA INSPECTION DATA

Purpose: This project provides estimates of level of exposure for hazards observed but not measured in NIOSH hazard surveys, to help identify occupational hazards throughout the U.S.

DSHEFS, Joseph A. Seta
CAN 504 Dates: 10/83-C

AN EPIDEMIOLOGIC STUDY OF IAQ

Purpose: This study will address the relationships between Indoor Air Quality (IAQ) and symptoms of disease including respiratory effects, headaches, and skin and eye irritation; and determine if inadequate ventilation is associated with these symptoms.

DSHEFS, David P. Brown
CAN 527 Dates: 10/89-09/93

COHORT MORTALITY STUDY OF ANTIMONY SMELTER WORKERS

Purpose: This epidemiologic study will assess the association between exposure to antimony and the risk of developing lung cancer.

DSHEFS, Teresa M. Schnorr
CAN 533 Dates: 10/83-09/90

MORTALITY STUDY OF WORKERS EXPOSED TO TOLUENE DIISOCYANATE

Purpose: This epidemiologic study will assess the association between exposure to TDI and the risk of developing respiratory cancer.

DSHEFS, Teresa M. Schnorr
CAN 534 Dates: 06/83-06/91

OCCUPATIONAL LUNG DISEASES

CASE-CONTROL STUDY OF LUNG CANCER IN TEAMSTERS UNION

Purpose: This epidemiologic and industrial hygiene study will assess the association between lung cancer in teamsters and exposures, especially to diesel exhaust. (Bladder cancer also will be evaluated.)

DSHEFS, Nelson K. Steenland
CAN 539 Dates: 10/83-09/90

LABORER'S UNION HEALTH PROGRAM

Purpose: This project will develop specific programs for health promotion and disease prevention for laborers. NIOSH and other Centers in CDC will serve as resources to assist the Laborer's National Health and Safety Fund in developing and implementing these programs.

DSHEFS, Paul Schulte
CAN 558 Dates: 10/88-09/91

URANIUM MINERS-LOW DOSE INVESTIGATION

Purpose: This epidemiologic study will assess the association between exposure to low levels of radon daughters and the risk of developing lung cancer.

DSHEFS, Robert J. Roscoe
CAN 567 Dates: 10/82-09/91

BERYLLIUM RETROSPECTIVE COHORT INVESTIGATION

Purpose: This epidemiologic study will assess the association between exposure to beryllium and the risk of developing lung cancer and other respiratory/cardiovascular diseases.

DSHEFS, Elizabeth M. Ward
CAN 583 Dates: 10/81-09/90

INJURY PREVENTION RESEARCH BRANCH MANAGEMENT

Purpose: This project will provide management and guidance for the implementation of national prevention strategies involving investigative laboratory field research with all types of respirators, chemical and other protective clothing and equipment, and associated physiological responses to such equipment.

DSR, Acting Chief IPRB
CAN 785 Dates: 10/85-C

SIMULATED WORKPLACE PROTECTION FACTORS

Purpose: This project will develop more accurate methods of measuring respirator performance which will improve NIOSH respirator certification and respirator performance, which in turn will reduce worker exposure to toxic chemicals.

DSR, Donald L. Campbell
CAN 786 Dates: 01/88-09/90

OCCUPATIONAL LUNG DISEASES

PHYSIOLOGICAL RESPONSES TO THE WEARING OF PROTECTIVE EQUIPMENT

Purpose: This project will examine the effects of hot, humid inspired air (45 degrees C, 90 percent RH) on inspired work of breathing by the measurement of dynamic lung compliance.

DSR, Nina L. Turner
CAN 812 Dates: 10/86-03/90

ORGANIC VAPOR CHALLENGE TO REPLACE CARBON TETRACHLORIDE

Purpose: This project will develop improved organic vapor and gas performance standards for cartridges and will enable respirator manufacturers to produce respirators that will better protect workers from airborne organic vapor/gas contaminants.

DSR, Ernest S. Moyer
CAN 828 Dates: 10/89-12/92

"USE TEST" FOR SCBA PERFORMANCE EVALUATION

Purpose: This project will modify current "use test" performance requirements and test procedures to reflect advancements in continuous, on-line measurement technology, the wide variety of improved SCBA available, and the physiological basis for appropriate test protocols.

DSR, Nina L. Turner
CAN 829 Dates: 10/89-12/92

WORKPLACE PROTECTION FACTOR (WPF) STUDY

Purpose: This project will develop and evaluate methods for measuring WPFs for air purifying particulate respirators (APPR). Measure WPFs for half and full face piece APPR at worksites. Compute and compare fifth percentile WPFS and APFS to determine if they are 10 (50 for full face), if the use of only 1 APF is justified, and if they vary by exposure agent/worker/brand, etc.

DSR, Barry G. Pallay
CAN 832 Dates: 10/86-09/91

FILTER LOADING EFFECTS WITH A "WORST CASE" DOP AEROSOL

Purpose: This project will develop improved performance standards for respirators and will enable respirator manufacturers to produce respirators that will better protect workers from airborne contaminants.

DSR, Ernest S. Moyer
CAN 835 Dates: 10/87-09/90

RESPIRATOR PROGRAM PROTECTION FACTOR (PPF) FIELD FEASIBILITY STUDY

Purpose: This project will investigate procedures for determining the efficiency of respirator programs.

DSR, Donald L. Campbell
CAN 836 Dates: 10/89-09/90

OCCUPATIONAL LUNG DISEASES

PROJECTED RESPIRATOR WPF VALUES

Purpose: This project will (1) develop analytical techniques, based on instantaneous facepiece pressure, to estimate the workplace performance of positive pressure SCBA, and (2) apply this method to positive pressure SCBAs used in firefighting.

DSR, Donald L. Campbell
CAN 837 Dates: 10/89-09/90

PROMULGATION OF 42 CFR 84

Purpose: This project will increase worker protection from airborne contaminants by upgrading the certification standards and increasing the safety and reliability of respirators.

DSR, Nancy J. Bollinger
CAN 839 Dates: 01/87-09/90

EVALUATION, CERTIFICATION, AND COORDINATION ACTIVITIES

Purpose: This project will provide judgment and guidance to the legislatively mandated respirator and coal mine dust personal sampler certification programs which will help to increase worker protection from airborne contaminants.

DSR, Nancy J. Bollinger
CAN 852 Dates: 05/72-C

AIR PURIFYING RESPIRATOR TESTING

Purpose: This project will increase worker protection from airborne contaminants by (1) approving respirators in accordance with regulations, (2) through the audit and complaints program assuring that respirators in the marketplace comply with regulations, and (3) providing expert advice on respirator applications.

DSR, Christopher C. Coffey
CAN 853 Dates: 05/72-C

ATMOSPHERE SUPPLIED RESPIRATOR TESTING

Purpose: This project will increase worker protection from airborne contaminants by (1) approving respirators in accordance with regulations, (2) through the audits and complaints program assuring that respirators in the marketplace comply with regulations, and (3) providing expert advice on respirator applications.

DSR, Samuel L. Terry
CAN 854 Dates: 05/72-C

COAL MINE DUST PERSONAL SAMPLER UNIT

Purpose: This project will increase worker protection from airborne contaminants by certifying CMDPSU which will provide more accurate measurements of particulate levels for MSHA compliance purpose.

DSR, John M. Dower
CAN 855 Dates: 05/72-C

OCCUPATIONAL LUNG DISEASES

QUALITY ASSURANCE DOCUMENTATION CONTROL

Purpose: This project will increase worker protection from airborne contaminants by (1) evaluating quality assurance of respirator manufacturers, and (2) through in-plant audit program assuring that respirators are reliable.

DSR, Theodore A. Pettit
CAN 857 Dates: 05/72-C

OPERATIONS/PROCEDURE REVISION TO IMPLEMENT NEW REGULATIONS

Purpose: This project will revise the procedures used to select audits, process applications, and will develop a decision logic for selecting laboratory evaluations to be performed to validate the manufacturers' data. This project will also finalize the laboratory test procedures needed to implement the new tests in the revised regulations.

DSR, Nancy J. Bollinger
CAN 862 Dates: 10/89-09/90

LABORATORY MODIFICATION NEEDED FOR IMPLEMENTATION OF NEW REGULATIONS

Purpose: This project will increase the safety and reliability of certified respirators by improving test criteria, therefore increasing protection from airborne contaminants.

DSR, Christopher C. Coffey
CAN 863 Dates: 10/89-09/91

SAFETY AND HEALTH FOR OCCUPATIONAL PROFESSIONALS (SHOP)

Purpose: This project specifically conducts education and training programs to implement information dissemination strategies in occupational lung diseases, musculoskeletal injuries, psychological disorders, and disorders of reproduction.

DTMD, Michael Colligan
CAN 766 Dates: 10/88-C

INDOOR AIR QUALITY INITIATIVE

Purpose: Informational materials, lectures, courses, and other training materials will be developed, tested, and used in NIOSH/ERC continuing education programs.

DTMD, P.G. Rentos
CAN 769 Dates: 10/88-09/92

AGRICULTURAL CENTERS FOR RESEARCH, EDUCATION, AND PREVENTION PROGRAMS

Purpose: This project will develop the educational resources to prepare various disciplines with knowledge to reduce fatalities, disease, and injury in the agricultural sector.

DTMD, P.G. Rentos
CAN 772 Dates: 10/89-C

OCCUPATIONAL LUNG DISEASES

SMALL BUSINESS INITIATIVE

Purpose: This project will provide the educational component for the NIOSH small business initiative. These instructional materials will create an awareness of and provide knowledge on occupational hazards, their health effects, and control strategies to reduce the hazards.

DTMD, James B. Walters
CAN 774 Dates: 10/88-C

AUDIO VISUAL/GRAPHICS SUPPORT SERVICES

Purpose: Numerous educational curriculum modules and technical documents, both written and video, require information to be provided in the form of graphic illustration or other visual presentation. This project will produce such materials in support of the dissemination of the NIOSH strategies.

DTMD, Glenda M. White
CAN 777 Dates: 10/89-09/90

PROJECT EPOCH

Purpose: This project will provide an ongoing educational program for physicians and residents in the primary care specialties to improve their skills in recognizing and treating occupational diseases.

DTMD, Norbert J. Berberich
CAN 790 Dates: 10/89-C

MUSCULOSKELETAL INJURIES

ERGONOMIC RISKS FROM TOOL USAGE AND DESIGN

Purpose: This project will evaluate the effects of tool usage and design factors that contribute to hand/wrist disorders. Prototype control studies will be conducted to illustrate improved tool design.

DBBS, Daniel J. Habes
CAN 244 Dates: 10/87-09/91

BIODYNAMICS OF FREQUENT ASYMMETRIC LIFTING

Purpose: This project will provide biomechanical data on the capacity of young and older workers to safely perform frequent, asymmetric lifting tasks.

DBBS, Thomas R. Waters
CAN 246 Dates: 10/89-09/93

APPRAISAL/EXPANSION OF MANUAL MATERIALS HANDLING LIMITS

Purpose: This project will assemble a committee of experts to expand/develop ergonomic guidelines needed for redesign of jobs for intervention programs to prevent low back pain, a common form of musculoskeletal disorder.

DBBS, Vern Putz-Anderson
CAN 252 Dates: 10/84-09/90

SHOULDER/NECK MUSCLE TENSION FOR REPETITIVE WORK

Purpose: This project will develop control techniques in the form of work-rest ratios for reducing shoulder and neck fatigue from overhead work.

DBBS, Vernon Putz-Anderson
CAN 260 Dates: 10/85-09/92

BIOMOLECULAR MARKERS OF CHRONIC TRAUMA

Purpose: This project will identify biomolecular markers which will be used to detect the development of occupationally related joint injury at an early, pre-clinical stage. Those workers most vulnerable to this condition can potentially be identified before irreversible damage occurs and moved to a less physically demanding job.

DBBS, James P. Mastin
CAN 344 Dates: 10/88-09/92

DEVELOPMENT OF AN INTERVENTION MODEL FOR MUSCULOSKELETAL INJURIES

Purpose: This project will involve an intervention program or plan to reduce identified musculoskeletal problems.

DPSE, James H. Jones
CAN 422 Dates: 10/88-09/91

MUSCULOSKELETAL INJURIES

CARPET LAYERS KNEE TRAUMA ALERT

Purpose: This project will develop an alert, in conjunction with DSHEFS and DBBS, that identifies the high risk job categories and associated causal factors for carpet layers knee trauma. The alert will make recommendations for preventing such injuries.

DSDTT, Laurence D. Reed
CAN 107 Dates: 10/89-09/90

CUMULATIVE TRAUMA DISORDERS POSITION PAPER

Purpose: This project will provide a critical evaluation of information on occupationally-induced cumulative trauma disorders. The evaluation will be used to develop a position paper that will provide a recommendation to the Office of the Director, NIOSH, concerning the need to develop a document (e.g. CD, CIB) addressing cumulative trauma disorders.

DSDTT, Austin F. Henschel
CAN 138 Dates: 10/89-09/90

INTERVENTION PROGRAM - MUSCULOSKELETAL DISORDERS/MEAT PACKERS

Purpose: Effective implementation of an intervention program will lead to a reduction in CTD disorders in this industry. Currently, there is no detailed description of an intervention program available to the industry which NIOSH believes is scientifically valid.

DSHEFS, Lawrence J. Fine
CAN 517 Dates: 10/89-10/92

SENTINEL HEALTH EVENT FOLLOW-BACK

Purpose: Project will provide a surveillance system to identify where preventable occupational disease is occurring which will assist in direct prevention and help prioritize further research.

DSHEFS, Paul J. Seligman
CAN 518 Dates: 10/85-09/92

P.C. VERSION OF LIFE TABLE ANALYSIS SYSTEM

Purpose: This project will improve the overall research program by providing state-of-the-art methods.

DSHEFS, David P. Brown
CAN 526 Dates: 10/88-09/92

EVALUATION OF UPPER EXTREMITY MUSCULOSKELETAL DISORDERS

Purpose: This study will assess the feasibility of conducting large scale industrywide studies of manufacturing and service workers involved in repetitive work of the upper extremities.

DSHEFS, Marie Sweeney
CAN 528 Dates: 10/89-09/93

best copy available

MUSCULOSKELETAL INJURIES

NATIONAL ESTIMATE OF WORK-RELATED CUMULATIVE TRAUMA DISORDERS

Purpose: Project will provide a national estimate of the burden of cumulative trauma disorders, injuries, and disability which will assist in direct prevention and help prioritize further research.

DSHEFS, Shiro Tanaka
CAN 546 Dates: 10/89-09/90

SURVEYOR TRAINING

Purpose: The purpose of this project is to identify and provide the specific training needed to survey and assess the chemical, physical, biological, and safety hazards in the agriculture sector (e.g., knowledge about the working methods in agriculture, the ability to recognize hazards, the capability to conduct survey interviews and record observations).

DSHEFS, David H. Pedersen
CAN 566 Dates: 10/89-09/90

RURAL HOSPITAL DISEASE/INJURY SURVEILLANCE AND FOLLOW-BACK

Purpose: This project will supply NIOSH technical assistance, providing needed resources in a timely manner, building capacity at the local level, and strengthening the occupational health skills of nurses in rural hospitals. In doing this, NIOSH will identify important problems (surveillance) and develop the capacity to discover and assess problems.

DSHEFS, Eugene F. Fruend
CAN 568 Dates: 10/89-C

DISABILITY SURVEILLANCE OF OCCUPATION AND INDUSTRY

Purpose: The project provides unique data on permanent disability that relates to occupation and industry subgroups of American workers. The project's database is a building block for the branch's effort to develop a nationwide system for the surveillance of occupationally related morbidity and mortality.

DSHEFS, Robert M. Brackbill
CAN 629 Dates: 10/80-C

NIOSH ATLAS OF LOW BACK TESTS/MEASURES: CLINICAL TRIALS

Purpose: The NIOSH Low Back Atlas has established a series of standardized diagnostic tests/measures which have the potential to classify low back musculoskeletal injuries. The clinical trials proposed in this study will serve to develop and validate the discriminate validity of the Low Back Atlas for assessing low back injuries.

DSR, Roger M. Nelson
CAN 815 Dates: 10/87-09/91

ERGONOMIC TECHNICAL ASSISTANCE/RESEARCH IDENTIFICATION

Purpose: This project will reduce biomechanical stress to the musculoskeletal system by providing recommendations for improving task, tool, and workstation design on selected jobs.

DSR, David E. Nestor
CAN 822 Dates: 10/87-09/90

MUSCULOSKELETAL INJURIES

HEALTH CARE INDUSTRY - LOW BACK EPIDEMIOLOGIC STUDY

Purpose: This project will complete an intervention study to evaluate the efficacy of an ergonomic strategy for prevention of back injuries among nursing assistants working in a nursing home.

DSR, Roger C. Jensen
CAN 838 Dates: 10/84-09/90

LOW BACK INJURY CONTROL AND REHAB. STRATEGIES FOR THE FEDERAL WORKER

Purpose: This project will examine the efficacy of proactive injury control methods on the outcome of low back injury among federal workers who file a workers' compensation claim.

DSR, Roger M. Nelson
CAN 875 Dates: 10/89-09/90

PROJECT SHAPE

Purpose: This project will increase OSH awareness through instructional materials in the engineering profession. This, in turn, will result in engineering efforts to prevent occupational hazards through engineering design and other engineering functions.

DTMD, John T. Talty
CAN 775 Dates: 10/88-C

OCCUPATIONAL CANCERS

INHIBITION OF INTERCELLULAR COMMUNICATION BY WORKPLACE CHEMICALS

Purpose: Methods for measuring inhibition of intercellular communication (ICC) in human keratinocytes will be developed. The inhibition of ICC in human keratinocytes will be evaluated as a possible short-term assay for skin tumor promoters. Teratogens and nonteratogens will be tested for their effect on ICC in V79 cells.

DBBS, Mark A. Toraason
CAN 288 Dates: 10/88-09/91

TEMPORAL FACTORS INFLUENCING CARCINOGENICITY OF INDUSTRIAL CHEMICALS

Purpose: This project will provide information needed to justify short-term exposure limits for rapid acting carcinogens as assessed by this dose-rate study.

DBBS, William J. Moorman
CAN 313 Dates: 10/85-09/91

BIOLOGICAL MONITORING FOR ARYL AMINES

Purpose: This project will investigate analytical techniques for detection of accessible tissue DNA or hemoglobin adducts for use in biomonitoring of industrial carcinogens. The ultimate goal is the development of a routine analytical procedure which indicates exposure and relates qualitatively and/or quantitatively to carcinogenesis.

DBBS, Kenneth L. Cheever
CAN 314 Dates: 10/85-09/91

IMMUNOLOGICAL MARKERS OF HERBICIDE EXPOSURE

Purpose: Project will identify immunologic changes in animals and humans resulting from exposure to the model agent herbicide, Alachlor. Specific immune system damage may be a major mechanism of disease production. Alachlor antibodies will be identified which can serve as an indicator of exposure.

DBBS, Raymond E. Biagini
CAN 343 Dates: 10/89-09/92

INHALATION TOXICOLOGY AND RESEARCH SUPPORT

Purpose: This project will provide resources for the development of generation techniques, measurement methods, and quality control procedures for inhalation chamber exposure atmospheres for NIOSH inhalation toxicology research and the conduct of the inhalation exposures required for DBBS research and collaborative research with other divisions (DRDS).

DBBS, Alexander W. Teass
CAN 379 Dates: 10/80-C

ANIMAL HUSBANDRY SERVICES

Purpose: This project will manage and utilize resources to provide efficient animal husbandry and effective health surveillance for experimental animals used for DBBS research programs.

DBBS, Frances M. Reid
CAN 385 Dates: 10/76-C

OCCUPATIONAL CANCERS

DIAGNOSTIC AND RESEARCH PATHOLOGY

Purpose: This project will provide gross and microscopic examination/diagnosis for experimental animal tissues and consultation pathology services for NIOSH research studies.

DBBS, Richard A. Salomon
CAN 386 Dates: 10/76-C

APPLIED CONTROL TECHNOLOGY STUDIES

Purpose: This project provides for dissemination of the results of control technology studies to industry, labor, and other agencies. It also provides for the investigation of emerging problems and control techniques. These may include substances for which regulatory action is considered, new processes or manufacturing technologies, etc.

DPSE, James A. Gideon
CAN 403 Dates: 10/80-C

CONTROL TECHNOLOGY FOR SMALL BUSINESS

Purpose: Develop and disseminate control technology information to radiator repair shops, which have been selected as a small business for intervention.

DPSE, John W. Sheehy
CAN 415 Dates: 10/88-09/91

CONTROL OF FORMALDEHYDE EXPOSURES IN EMBALMING PROCEDURES

Purpose: This project will develop improved methods for the control of formaldehyde during the embalming process.

DPSE, Michael G. Gressel
CAN 417 Dates: 10/88-09/90

A SAMPLING AND ANALYTICAL METHOD FOR AIRBORNE DIESEL-EXHAUST PARTICLES

Purpose: A sampling and analytical method for diesel-exhaust particles in workplace air will be developed. This project will provide support for exposure surveillance and health effects evaluations.

DPSE, Mary E. Birch
CAN 432 Dates: 10/89-12/91

CHEMICAL CHARACTERIZATION OF ROOFING ASPHALT FUME

Purpose: The project will provide analytical chemistry support for the identification of carcinogens in petroleum asphalt fume.

DPSE, Robert A. Lunsford
CAN 433 Dates: 01/83-09/90

OCCUPATIONAL CANCERS

ANALYSIS OF EXHALED BREATH

Purpose: As a result of this project, a unified device for sampling solvents in both mixed and alveolar breath has been developed. Sidestream and mainstream sampling options are provided. The device is being modified to permit continuous sidestream alveolar sampling. The sampler will be evaluated in a study of solvent uptake by humans.

DPSE, Robert A. Glaser
CAN 435 Dates: 10/83-09/91

PORTABLE MASS SPECTROMETER OR FTIR EVALUATION

Purpose: The goal will be achieved through the evaluation of either a mass spectrometer or FTIR for use in the field by trained industrial hygienists where present monitoring techniques are inadequate.

DPSE, Harley V. Piltingsrud
CAN 444 Dates: 10/89-09/91

ENGINEERING CONTROL ASSISTANCE

Purpose: The project will provide engineering control design and support to DSHEFS and will develop control research projects consistent with Institute goals. Engineering support of DSHEFS projects will provide control recommendations to solve worker exposure problems.

DPSE, Robert T. Hughes
CAN 446 Dates: 01/88-C

SENSOR DEVELOPMENT

Purpose: Develop gas or vapor monitors based on both micro-electronic surface acoustic wave (SAW) sensors and on color-changing selective films "chromo-films."

DPSE, Guy E. Burroughs
CAN 447 Dates: 10/86-09/90

APPLIED MONITORING STUDIES

Purpose: This project will provide monitoring instrumentation selection and modification and support to other NIOSH divisions and will develop projects consistent with Institute goals. Monitoring support to DSHEFS projects will provide recommendations for monitoring worker exposures through the use of direct reading instruments.

DPSE, Martin T. Abell
CAN 456 Dates: 10/89-C

COMPREHENSIVE ANALYTICAL CHEMISTRY SERVICES

Purpose: This project coordinates requests from NIOSH researchers for analytical chemistry support for all NIOSH projects which require chemical analyses. The project also provides overall laboratory administration of sample analyses performed either on contract or in the NIOSH laboratories.

DPSE, Donald D. Dollberg
CAN 482 Dates: 10/83-C

OCCUPATIONAL CANCERS

ANALYTICAL SUPPORT TO DBBS RESEARCH AND IWSB/DSHEFS

Purpose: Analytical support to DBBS and IWSB/DSHEFS will be provided in the areas of (1) inhalation studies of toxic substances, (2) chemical characterization of complex mixtures such as diesel emissions and pesticides, and (3) industry-wide studies of DMF workers and methanol as a vehicle fuel.

DPSE, John L. Holtz
CAN 483 Dates: 10/85-C

ANALYTICAL CHEMISTRY SUPPORT TO DPSE RESEARCH

Purpose: This project provides for chemistry support to DPSE research activities. Sampling and analytical support will be given to the control technology program's attempts to prevent the exposure of workers to hazardous levels of chemical agents. New measurement methods for asbestos will also be evaluated.

DPSE, Donald D. Dollberg
CAN 484 Dates: 10/85-C

CONTROL OF PARTICULATE AND GASEOUS AGENTS BY AIR CURTAIN TECHNOLOGY

Purpose: Control design criteria will be developed for processes where contaminants are emitted over a large area or where local exhaust is not possible (bench top operations). While focused on reduction of formaldehyde and wood dust, technology will be generically applicable to a number of other processes.

DPSE, Vladimir Hampl
CAN 492 Dates: 10/85-09/90

QUANTITATIVE RISK ASSESSMENT

Purpose: This project will make QRA efforts to understand the basic mechanism of disease causation; evaluate the metabolic pathways and variation in response to a particular substance; estimate the adverse health risks to humans; provide a basis for prioritizing the issues for regulatory recommendations and provide a component for decision making.

DSDTT, Leslie T. Stayner
CAN 085 Dates: 10/70-C

JOINT NIOH/NIOSH ACRYLAMIDE BASIS FOR A RECOMMENDED STANDARD

Purpose: This project will provide a critical evaluation of the health risks associated with exposure to acrylamide. The evaluation will be used to develop (jointly with NIOH) a basis for a recommended standard that will summarize all health effects on humans and animals associated with acrylamide.

DSDTT, Vlasta B. Molak
CAN 117 Dates: 10/89-09/90

ACETALDEHYDE/PROPANEDIAL-CURRENT INTELLIGENCE BULLETIN (CIB)

Purpose: This project will provide a critical evaluation of the health risks associated with exposures to acetaldehyde/propanedial. The evaluation will be used to develop a CIB that will report new data suggesting that acetaldehyde/propanedial are potential occupational carcinogens.

DSDTT, Brenda K. Boutin
CAN 127 Dates: 10/89-09/90

OCCUPATIONAL CANCERS

RUBBER PRODUCTS MANUFACTURING POSITION PAPER

Purpose: This project will provide a critical evaluation of the health hazards in the rubber products manufacturing industry. The evaluation will be used to develop a position paper that will provide recommendations to the OD, NIOSH, concerning the need to develop a document (e.g., CD, CIB) addressing the hazards from employment in this industry.

DSDTT, Faye Rice
CAN 139 Dates: 10/89-09/91

ASPHALT POSITION PAPER

Purpose: This project will provide a critical evaluation of information on the health risks associated with exposure to asphalt. The evaluation will be used to develop a position paper that will provide a recommendation to the OD, NIOSH, concerning the need to develop a document (e.g., CD, CIB) addressing the hazards of exposure to asphalt.

DSDTT, Crystal L. Ellison
CAN 144 Dates: 10/89-09/91

CASE-CONTROL SURV. TO TEST HYPOTHESES GENERATED BY COMPUTER MAPS

Purpose: This project will help to build death certificate based case-control studies as a new, in-house surveillance capability. These hypothesis testing activities facilitate the institute's setting of research priorities.

DSHEFS, Cynthia Robinson
CAN 509 Dates: 10/83-C

INDUSTRYWIDE STUDY OF WORKERS EXPOSED TO 4,4'-METHYLENE DIANILINE

Purpose: This study will use several innovative techniques and new analytical methods to sample for MDA. These new procedures will be compared to routine methods.

DSHEFS, Mark F. Boeniger
CAN 512 Dates: 10/84-09/90

MORTALITY AND I.H. STUDY OF AUTOMOTIVE WOOD DIE AND MODEL MAKERS

Purpose: This epidemiologic study will assess the association between exposure in the automotive wood die and model making industry and the risk of developing cancer.

DSHEFS, Robert J. Roscoe
CAN 516 Dates: 10/87-09/90

ESTIMATION OF EXPOSURES AND RELEASES FROM UNIT OPERATIONS

Purpose: This project will help define historical exposures around unit operations increasing our understanding of process modeling.

DSHEFS, Thomas F. Bloom
CAN 519 Dates: 10/88-09/91

OCCUPATIONAL CANCERS

REGISTRY OF DIOXIN WORKERS AND MORTALITY STUDY

Purpose: This epidemiologic study will assess the association between exposure to dioxin and the risk of developing cancer, especially soft tissue sarcoma.

DSHEFS, Marilyn A. Fingerhut
CAN 525 Dates: 10/79-09/91

ENVIRONMENTAL HEALTH ASSESSMENT OF EXPOSURE TO ALACHLOR-ENHANCEMENT

Purpose: This study will evaluate exposure to alachlor among agricultural applicators using environmental and biological exposure measurements. If feasible, the study will also include markers of genotoxicity.

DSHEFS, Wayne T. Sanderson
CAN 529 Dates: 10/89-09/92

EPIDEMIOLOGIC METHODS DEVELOPMENT

Purpose: This epidemiologic methods project will improve the overall research program being conducted as part of the industrywide studies program by maintaining state-of-the-art methods.

DSHEFS, Nelson K. Steenland
CAN 532 Dates: 10/84-C

MORTALITY STUDY OF WORKERS EXPOSED TO HALOWAX

Purpose: This epidemiologic study will assess the association between exposure to halowax and the risk of developing cancer.

DSHEFS, Elizabeth M. Ward
CAN 536 Dates: 10/83-09/91

EPI. STUDY OF BLADDER CANCER AMONG WORKERS EXPOSED TO O-TOL. O-ANILINE

Purpose: This study will assess the association between exposures at a chemical manufacturing plant and the occurrence of bladder cancer and heart disease.

DSHEFS, Elizabeth M. Ward
CAN 537 Dates: 10/88-09/91

UPDATE OF COMPLETED COHORT MORTALITY STUDIES

Purpose: These are epidemiologic studies that assess the association between exposure and the risk of developing disease (primarily cancer).

DSHEFS, David P. Brown
CAN 542 Dates: 10/82-C

OCCUPATIONAL CANCERS

MEDICAL, BIOMETRIC AND IH STUDY OF EMERGING PROBLEMS

Purpose: Provide management and guidance for the implementation of the national prevention strategies involving epidemiologic research.

DSHEFS, Marilyn M. Fingerhut
CAN 543 Dates: 10/79-C

EXPOSURE ASSESSMENT OF WORKERS EXPOSED TO ACRYLONITRILE

Purpose: This project will help establish the link between acrylonitrile and cancer in humans and develop new methods for historical exposure assessment.

DSHEFS, John Zey
CAN 545 Dates: 10/88-09/91

TESTICULAR CANCER SCREENING IN LEATHER FINISHERS

Purpose: The screening program will assess the prevalence of testicular cancer among a population of leather finishers and characterize work histories in workers with and without testicular cancer.

DSHEFS, Geoffrey M. Calvert
CAN 548 Dates: 10/88-09/90

SOFT TISSUE SARCOMA VALIDATION STUDY

Purpose: This project will assess misclassification of soft tissue sarcomas based on ICD coding of underlying cause of death in the dioxin and halowax mortality studies.

DSHEFS, Elizabeth M. Ward
CAN 552 Dates: 10/88-06/91

BERYLLIUM CASE CONTROL STUDY

Purpose: This study will assess the relationship between level and type of beryllium exposure and risk of lung cancer.

DSHEFS, Wayne T. Sanderson
CAN 553 Dates: 10/88-09/92

WORKER NOTIFICATION

Purpose: Notification of workers regarding their risk of disease results in some prevention of the disease by encouraging screening, health promotion, and better awareness (education).

DSHEFS, Paul A. Schulte
CAN 554 Dates: 03/85-C

OCCUPATIONAL CANCERS

MULTIPLE CAUSE OF DEATH

Purpose: This multiple-cause-of-death project will improve the overall research program being conducted as part of the industrywide studies program by maintaining state-of-the-art methods.

DSHEFS, Nelson K. Steenland
CAN 555 Dates: 10/88-09/92

FEASIBILITY ASSESSMENTS FOR NEW TOPICS

Purpose: This project will 1) fill in data gaps on exposure to agents, 2) locate suitable cohorts for epidemiologic investigation, and 3) determine the feasibility of epidemiologic investigations on exposure of interest.

DSHEFS, Alice Greife
CAN 556 Dates: 10/88-09/92

ETHYLENE OXIDE MORTALITY STUDY

Purpose: This epidemiologic study will assess the association between exposure to ethylene oxide and the risk of developing leukemia.

DSHEFS, Nelson K. Steenland
CAN 557 Dates: 10/82-09/91

MORTALITY STUDY OF CHEMICAL PLANTS IN KANAWHA VALLEY, WEST VIRGINIA

Purpose: This epidemiologic study will assess the association between exposures in a large chemical plant and the risk of developing cancer and other chronic diseases.

DSHEFS, Elizabeth M. Ward
CAN 560 Dates: 10/79-09/93

GENOTOXIC EFFECTS OF FORMALDEHYDE EXP. OF MORTUARY SCIENCE STUDENTS

Purpose: This project will assess the development of cytogenetic changes among students and staff at a college of mortuary science following exposure to formaldehyde.

DSHEFS, Anthony Suruda
CAN 569 Dates: 10/89-09/92

INVESTIGATION OF WORKERS EXPOSED TO MBOCA

Purpose: This study will assess the presence of biological markers of bladder cancer in exposed workers.

DSHEFS, Elizabeth M. Ward
CAN 572 Dates: 10/82-09/90

OCCUPATIONAL CANCERS

EVALUATION OF RADON/RADON PROGENY EXPOSURES TO RADON MITIGATORS

Purpose: This project will determine the factors involved in exposure to radon during mitigation activities.

DSHEFS, Thomas F. Bloom
CAN 573 Dates: 10/89-09/92

COMPUTERIZATION OF IHS/IWSB FILES

Purpose: This project will provide valuable information on exposure levels by year and by standard industrial classification for many suspect carcinogens.

DSHEFS, Thomas F. Bloom
CAN 574 Dates: 10/89-09/93

LUNG CANCER MORTALITY AMONG BLACK WORKERS

Purpose: This project will seek to determine what factors are responsible for elevated lung cancer rates among black males.

DSHEFS, Nelson K. Steenland
CAN 575 Dates: 10/89-09/91

CANCER SCREENING IN FARMERS

Purpose: This project will develop a series of cancer control demonstration projects. It will also provide for a series of studies to identify barriers to effective cancer control and to evaluate markers of premalignant changes.

DSHEFS, Paul A. Schulte
CAN 577 Dates: 10/89-09/92

SUPPORT OF EPA'S ENVIRONMENTAL EPIDEMIOLOGIC PROGRAM

Purpose: This study will assess the role of biological markers among workers who have been exposed to ethylene oxide which is of interest to the EPA and NIOSH.

DSHEFS, Paul A. Schulte
CAN 607 Dates: 10/85-09/90

JOB/EXPOSURE MATRIX

Purpose: This project will provide researchers with a technique for assessing 1971-1983 change in workers' exposure to potential hazards through computerization of an industry/occupation/hazard matrix.

DSHEFS, William K. Sieber
CAN 637 Dates: 10/85-C

OCCUPATIONAL CANCERS

ACCESS TO NOHS DATABASE - PROFILE DEVELOPMENT

Purpose: Specific dissemination strategies will be developed for workers at risk of exposure to hazards that result in diseases.

DSHEFS, Joseph A. Seta
CAN 662 Dates: 10/78-C

TRADENAME INGREDIENTS - NATIONAL OCCUPATIONAL EXPOSURE SURVEY (NOES)

Purpose: This project will result in development of an updated occupational hazard file as a necessary prerequisite for a national database that can be used to assess industry hazard changes during the period 1971-1983.

DSHEFS, David S. Sundin
CAN 663 Dates: 10/77-C

INDUSTRIAL HYGIENE AIR SAMPLING SURVEY EPA SUPERFUND SITES

Purpose: Characterization of toxic airborne and skin exposures among cleanup employees will allow selection of personal protective equipment based upon the degree of the measured exposure.

DSHEFS, Gregory Kinnes, Mary Newman
CAN 664 Dates: 10/88-10/90

DRAKE REGISTRY AND SCREENING PROJECT

Purpose: This study will develop a structure for identifying workers at high risk of disease and provide the opportunity for the delivery of services.

DSHEFS, Paul Schulte
CAN 894 Dates: 10/88-09/91

PERCUTANEOUS ABSORPTION TO EVALUATE THE STANDARD CPC PERMEATION METHOD

Purpose: This project will evaluate the relative permeation between chemical protective clothing and human or animal skin from values found in the literature.

DSR, Ronald L. Mickelsen
CAN 880 Dates: 10/88-09/91

COURSES/MODULES DEVELOPMENT

Purpose: This project will provide for the development of training materials for occupational safety and health practitioners and other target audiences identified in the prevention strategy documents through the continuing education network of NIOSH and the Educational Resource Centers.

DTMD, Norbert J. Berberich
CAN 765 Dates: 10/88-C

OCCUPATIONAL CANCERS

HAZARDOUS SUBSTANCES TRAINING

Purpose: This project will increase the occupational safety and health knowledge base of state, local, and other health professionals to carry out their responsibilities in the management of hazardous substance activities. This will help prevent the major health and safety environmental problems nationwide.

DTMD, Bernadine B. Kuchinski
CAN 779 Dates: 10/89-C

SEVERE OCCUPATIONAL TRAUMATIC INJURIES

FEASIBILITY EVALUATIONS AND STRATEGIES FOR HAZARD SURVEILLANCE

Purpose: This project will identify patterns of management which promote or prevent proper control of occupational exposures. Identifying these patterns will improve effective communication and technology transfers with employers and managers.

DSDTT, Heinz W. Ahlers
CAN 093 Dates: 10/89-09/91

EXPLOSIONS/FLAMMABLE LIQUIDS ALERT

Purpose: This project will develop an alert in conjunction with DSR that identifies the causal factors associated with explosions related to the transport of flammable liquids in pipelines. The alert will make recommendations for preventing such explosions.

DSDTT, Laurence D. Reed
CAN 108 Dates: 10/89-09/90

OCCUPATIONALLY RELATED HOMICIDES ALERT

Purpose: This project will develop an alert in conjunction with DSR that identifies the high risk job categories and associated causal factors for occupational homicides. The alert will make recommendations for preventing such homicides.

DSDTT, Laurence D. Reed
CAN 112 Dates: 10/89-09/90

LOCKING AND TAGGING OF ENERGY SOURCES ALERT

Purpose: This project will develop an alert in conjunction with DSR that identifies the high risk job categories and associated causal factors for deaths and injuries related to the inappropriate locking and tagging of hazardous energy sources. The alert will make recommendations for preventing such injuries/deaths.

DSDTT, Laurence D. Reed
CAN 114 Dates: 10/89-09/90

CONFINED SPACES POSITION PAPER

Purpose: This project will provide a critical evaluation of recent information on the health risks of working in confined spaces. The evaluation will be used to develop a position paper that will provide a recommendation to the OD, NIOSH concerning the need to revise the Institute's Criteria Document on confined spaces.

DSDTT, Dannie C. Middleton
CAN 146 Dates: 10/89-09/90

CARPAL TUNNEL STUDY

Purpose: This study will give an estimate of the incidence of work-related carpal tunnel syndrome seen in the offices of primary care doctors and provide insight into the operation of provider based surveillance of work-related disease and injury.

DSHEFS, Paul Seligman
CAN 507 Dates: 11/88-09/90

SEVERE OCCUPATIONAL TRAUMATIC INJURIES

SURVEY INSTRUMENT DESIGN; HAZARD QUESTIONNAIRE

Purpose: This project will develop the model "exposure" questionnaire for the Farm Health and Hazard Survey in order to identify appropriate chemical, physical or biological agents, and current practices to control these exposures.

DSHEFS, Joseph A. Seta
CAN 579 Dates: 10/89-09/90

DISSEMINATION

Purpose: This project will provide coordination of DSR dissemination planning, document, and information product development, and program information, as well as investigate methods of evaluating the impact of information products as interventions.

DSR, Herbert I. Linn
CAN 693 Dates: 10/87-09/90

LOCAL AREA NETWORK DEVELOPMENT

Purpose: This project will improve division information handling systems by enabling data, software, and equipment sharing, and by promoting a workgroup approach to information management. The LAN will enhance division generation of reports and graphics, speed the performance of administrative tasks, and improve communications throughout the division.

DSR, Herbert I. Linn
CAN 694 Dates: 10/88-09/90

SAFETY IN HAZARDOUS MATERIALS INCIDENTS

Purpose: This project will develop a demonstration computerized expert system for selecting respiratory protection based on the NIOSH respirator decision logic. This will enable the rapid selection of appropriate respiratory protection for use in responding to hazardous materials incidents using a PC/DOS computer system.

DSR, Donald F. Knowles, Jr.
CAN 803 Dates: 10/81-C

OCCUPATIONAL FATALITY INJURY SURVEILLANCE

Purpose: This project will identify the number and rate of occupational fatalities occurring in the nation through establishment of a national traumatic occupational fatality data base.

DSR, Nancy Stout
CAN 805 Dates: 10/84-C

FATAL ACCIDENT CIRCUMSTANCES AND EPIDEMIOLOGY-TECHNICAL ASSISTANCE

Purpose: This project will identify personal, organizational, environmental and circumstantial risk factors contributing to occupational fatalities and injuries.

DSR, Virgil J. Casini
CAN 807 Dates: 10/83-C

SEVERE OCCUPATIONAL TRAUMATIC INJURIES

GRAIN HANDLING INJURY AND FATALITY PREVENTION

Purpose: This project will develop a work practices guide to provide scientifically-sound recommendations on safe work practices to reduce the hazards of working with grain and grain handling systems on the farm and in other industrial environments.

DSR, John R. Myers
CAN 808 Dates: 10/89-09/92

DEVELOPMENT OF A WORKPLACE HOMICIDE PREVENTION STRATEGY

Purpose: This project will facilitate information transfer on workplace homicide among disciplines to serve as the foundation for NIOSH initiative in workplace homicide prevention. Deterrence and prevention strategies will be evaluated and efficacious strategies recommended for application in hazardous employments.

DSR, Catherine A. Bell
CAN 809 Dates: 10/89-09/92

ROLLOVER PROTECTION FOR AGRICULTURAL TRACTORS

Purpose: This project will reduce traumatic injuries and fatalities associated with agricultural tractors by evaluating the advantages and disadvantages of different rollover protection systems, making recommendations for effective intervention strategies, and supporting their implementation.

DSR, John R. Etherton
CAN 810 Dates: 10/89-09/92

REDUCING THE RISK OF FALLS THROUGH ROOF OPENINGS AND SKYLIGHTS

Purpose: This project will reduce the incidence of workers falling through skylights, and also through openings in elevated work surfaces by developing improved work practices and skylight design.

DSR, Thomas G. Bobick
CAN 813 Dates: 10/89-09/92

REDUCING FALLS FROM LARGE OFF-ROAD CONSTRUCTION VEHICLES

Purpose: This project will reduce the incidence of workers falling during ingress and egress of large off-road construction vehicles by developing improved access system design.

DSR, Thomas G. Bobick
CAN 814 Dates: 10/89-09/92

FAILURE ANALYSIS OF SUSPENDED SCAFFOLD HOISTING DEVICE

Purpose: This project will analyze how suspended scaffold hoist devices fail, recommend methods of preventing failure, and evaluate controls in a laboratory setting.

DSR, Ronald L. Stanevich
CAN 816 Dates: 10/89-09/91

SEVERE OCCUPATIONAL TRAUMATIC INJURIES

MACHINE SAFETY TECHNICAL ASSISTANCE/RESEARCH IDENTIFICATION

Purpose: This project will reduce traumatic injuries and fatalities on industrial machinery by providing research-based recommendations for safe machine workstations, concentrating on encouraging the implementation of existing technology, and on surveillance to compare effectiveness in applications for machine safety.

DSR, John R. Etherton
CAN 819 Dates: 10/87-09/90

QUANTIFIC OF RISK FACTORS FOR FALLS FROM BUILDINGS UNDER CONSTRUCTION

Purpose: This project will use epidemiologic methods for quantifying the risk factors associated with falls from buildings or structures during the construction phase.

DSR, Ronald L. Stanevich
CAN 825 Dates: 10/87-09/92

OCCUPATIONAL TRAUMATIC INJURY SURVEILLANCE OF FARMERS

Purpose: This project will promote a uniform agricultural traumatic injury surveillance system through extension safety specialists in various states, evaluate data acquired specifically from the agricultural industry, and perform analyses in support of interventions to reduce fatalities and traumatic injuries.

DSR, John R. Myers
CAN 827 Dates: 10/87-C

DEVELOPMENT OF NEW METHODS FOR OCCUPATIONAL INJURY SURVEILLANCE

Purpose: This project will develop new, and improve existing, methods of occupational injury surveillance. It will also provide statistical and epidemiologic support to various ISB traumatic and musculoskeletal research projects.

DSR, Julie C. Russell
CAN 834 Dates: 10/79-C

INJURY SURVEILLANCE BRANCH MANAGEMENT

Purpose: This project will coordinate, evaluate, and facilitate the merging of musculoskeletal and traumatic injury research and surveillance programs into a coordinated research initiative which will address the recommendations of the national strategies for prevention of the leading work-related diseases and injuries.

DSR, Timothy J. Pizatella
CAN 847 Dates: 10/85-C

STATE-BASED FATALITY SURVEILLANCE USING THE FACE MODEL

Purpose: This project will enable individual states to perform occupational epidemiologic research through fatality accident investigations. This pilot study will evaluate the fatality notification system, data collection procedures, and costs involved in developing and conducting fatality investigation programs within state agencies.

DSR, Dwayne L. Smith
CAN 870 Dates: 10/88-09/91

SEVERE OCCUPATIONAL TRAUMATIC INJURIES

DEVELOPMENT OF SURVEILLANCE METHODS FOR OCCUP MOTOR VEHICLE INJURIES

Purpose: This project will develop data sources and methods to monitor work-related motor vehicle injuries so the efficacy of interventions in the workplace can be evaluated.

DSR, Julie C. Russell
CAN 874 Dates: 10/88-09/91

U.S. FARM FAMILY HEALTH AND HAZARD SURVEY - INJURY SURVEILLANCE

Purpose: DSR, in cooperation with DSHEFS, NCHS and the states involved, will develop a questionnaire designed to determine the incidence of acute injury among agricultural workers.

DSR, William E. Crouse
CAN 877 Dates: 10/89-09/90

STUDY OF LINEMAN-RELATED FATALITIES AND INJURIES

Purpose: This project will identify potential injury risk factors for utility linemen and develop recommendations to reduce the risk of injury.

DSR, James W. Collins
CAN 878 Dates: 10/86-09/91

AGRICULTURAL HEALTH PROMOTION SYSTEM

Purpose: The health promotion system will provide direct access to agricultural workers and their families by utilizing the existing USDA cooperative extension programs within land grant universities. This access will permit the dissemination of safety and health information through the largest agricultural out-reach service in the United States.

DSR, John R. Myers
CAN 883 Dates: 10/89-C

STATE MODEL CONSTRUCTION SAFETY AND HEALTH PROGRAM

Purpose: This project will develop a model industrial safety and health program for the construction industry in the state of West Virginia. The purpose is to determine if such a program will be accepted and implemented by employers for the prevention of industry-specific occupational injuries.

DSR, Ronald L. Stanevich
CAN 884 Dates: 10/89-09/93

SURVEILLANCE OF SITE SPECIFIC CONSTRUCTION SAFETY AND HEALTH PROGRAM

Purpose: This project will require that all injuries sustained in the construction of the new ALOSH facility be reported and records of those injuries be maintained at the prime contractor level. Various techniques of identifying work situations likely to result in injury will be used to develop a contractor safety program self-evaluation tool.

DSR, Ronald L. Stanevich
CAN 885 Dates: 10/89-09/95

SEVERE OCCUPATIONAL TRAUMATIC INJURIES

INDUSTRY SPECIFIC INJURY REPORTING SYSTEM

Purpose: This project will develop and pilot test a surveillance system for a specific 4-digit SIC in construction. Determine feasibility of gathering injury information and the utility of such information to an employer for prevention purposes.

DSR, Ronald L. Stanevich
CAN 887 Dates: 10/89-03/92

CONSTRUCTION SAFETY AND HEALTH TRAINING

Purpose: This project will work with the key professional and trade groups in the construction industry to develop training materials for construction managers, foremen, apprentices, and vocational students in academic construction technology programs to produce a cadre of "competent persons" for implementing the OSHA standard 29 CFR 1926/1910.

DTMD, Michael L. Colligan
CAN 762 Dates: 10/89-C

PROJECT MINERVA

Purpose: This project will allow NIOSH to work collaboratively with an external academic-based organization to expedite the implementation of Project Minerva into the business school curriculum.

DTMD, Michael L. Colligan
CAN 776 Dates: 10/88-C

CURRICULUM DEVELOPMENT - VIDEO

Purpose: Project will provide media that will train workers at risk and others how to recognize, evaluate and control subject diseases and conditions.

DTMD, Raymond C. Sinclair
CAN 778 Dates: 10/89-09/90

OCCUPATIONAL CARDIOVASCULAR DISEASES

CELLULAR AND MOLECULAR CARDIAC TOXICOLOGY

Purpose: In vitro methods will be developed and tested as alternatives to using whole animals for studying potential cardiotoxins and for evaluating mechanisms of action of known cardiotoxins. Methods developed will be suitable for assessing heart function in adult as well as fetal and neonatal cardiac tissue.

DBBS, Mark Toraason
CAN 285 Dates: 10/86-09/90

EXPANSION OF DIRECT READING INSTRUMENTATION CAPABILITIES

Purpose: The project will assess the value and usability of various direct-reading instruments, promote on-site measurements through training of personnel and publication of studies of real-time monitors.

DPSE, Guy E. Burroughs
CAN 497 Dates: 10/88-09/91

MORTALITY AND IH STUDY OF BRIDGE AND TUNNEL OFFICERS EXP. TO CO

Purpose: This study will address whether the current OSHA standard is adequate to protect the working population from cardiovascular disease.

DSHEFS, Frank B. Stern
CAN 505 Dates: 10/88-09/92

CASE-CONTROL MORTALITY STUDY OF NITROGLYCERIN-EXPOSED WORKERS

Purpose: This epidemiologic study will assess the association between exposure to nitroglycerin and the risk of developing cardiovascular disease.

DSHEFS, Elizabeth M. Ward
CAN 513 Dates: 10/84-09/90

CARDIOVASCULAR INITIATIVE

Purpose: This initiative will identify and develop research projects on the association between workplace exposures and cardiovascular disease.

DSHEFS, Teresa M. Schnorr
CAN 538 Dates: 10/88-03/91

ARRHYTHMIA AMONG FREON EXPOSED WORKERS

Purpose: This project will examine whether Fluorocarbon 113 exposure is related to cardiac arrhythmias.

DSHEFS, Grace M. Egeland
CAN 582 Dates: 10/89-10/90

MORTALITY SURVEILLANCE OF OCCUPATION AND INDUSTRY

Purpose: By the latter part of this decade, occupational health researchers will have the data resources necessary to monitor U.S. occupational and industrial mortality differentials, to assist in implementation of the national strategies.

DSHEFS, Carol A. Burnett
CAN 633 Dates: 10/80-C

DISORDERS OF REPRODUCTION

COMBINED CHEMICAL/RF RADIATION TERATOGENESIS

Purpose: This project will determine whether long-term, low-level exposure to radiofrequency (RF) radiation acts synergistically in enhancing chemical-induced teratogenesis.

DBBS, David L. Conover
CAN 263 Dates: 10/89-09/92

METHODS FOR ASSESSING REPRODUCTIVE POTENTIAL IN FEMALES

Purpose: This project will evaluate the potential of currently available methods to assess reproductive function in females for incorporation into a test battery which can be used to assess the reproductive potential of female workers in occupational settings.

DBBS, James S. Kesner
CAN 287 Dates: 10/87-09/93

METHODS FOR DETERMINING EVIDENCE OF MUTATIONS DURING SPERMATOGENESIS

Purpose: This project will evaluate currently available methods to detect germ cell genetic damage and the most useful method(s) will be incorporated into the current DBBS semen profile so that both male reproductive impairment and genetic damage can be assessed using a single semen sample.

DBBS, Steven M. Schrader
CAN 289 Dates: 10/87-09/91

SEMEN ANALYSIS IN ANIMAL, LONGITUDINAL AND FIELD STUDIES

Purpose: This project will provide baseline data on semen characteristics of healthy, unexposed men which will be used to interpret reproductive effects observed in occupational groups. Animal studies will test for interspecies extrapolation of exposure effects.

DBBS, Steven M. Schrader
CAN 307 Dates: 10/84-09/91

IN VITRO SYSTEMS FOR HUMAN BIOLOGICAL MONITORING

Purpose: This project will evaluate in vitro human tissue culture methods for the determination of metabolic profiles of occupationally relevant chemicals. Metabolic profiles will expedite development of biological monitoring methods to determine worker exposure to suspected occupational toxicants.

DBBS, Donald E. Richards
CAN 317 Dates: 10/87-09/90

AMELIORATION OF RF EXPOSURES IN THE DIELECTRIC HEATING INDUSTRY

Purpose: This project will develop innovative engineering controls to reduce emissions from radiofrequency (RF) heaters. RF radiation is a reproductive hazard in animals and a suspected reproductive hazard in humans. These prototype controls should significantly reduce RF exposures and any associated risk of reproductive problems.

DBBS, William E. Murray
CAN 356 Dates: 10/88-09/90

DISORDERS OF REPRODUCTION

EPIDEMIOLOGIC STUDY OF RADIOFREQUENCY HEATER OPERATORS

Purpose: This project will determine if occupational exposure to radiofrequency (RF) radiation is related to reduced semen quality in male RF heater operators in the waterbed industry. RF radiation is a demonstrated reproductive hazard in animals, but human epidemiologic data are both limited and inadequate.

DBBS, Clinton Cox
CAN 358 Dates: 10/84-09/90

RF-INDUCED BODY CURRENT AND ABSORBED POWER DETERMINATIONS

Purpose: This project will assess workplace and operator variables affecting worker exposure to radiofrequency (RF) radiation, a suspected human reproductive hazard. NIOSH has documented that many RF sources exceed recommended exposure limits. RF-induced body currents will be used to quantify the influence of these variables on worker exposure.

DBBS, David L. Conover
CAN 363 Dates: 10/87-09/91

PARTICULATE AND TISSUE ANALYSIS RESEARCH AND SERVICE

Purpose: This project will use electron microscopy and microprobe analysis to investigate fiber durability and transport following intrapleural implantation in rats and to size quartz particles being used in an inhalation study. Electron microscopy and particle analysis support will be provided to other NIOSH research programs as requested.

DBBS, Stanley F. Platek
CAN 387 Dates: 10/76-C

CONTROL OF ANESTHETIC GASES IN DENTAL OPERATORIES

Purpose: The project will evaluate and/or develop and recommend controls for reducing persistent over-exposures to anesthetic gases in dental operatories. This information will be disseminated through the American Dental Association and other professional organizations.

DPSE, James D. McGlothlin
CAN 405 Dates: 10/86-09/90

EVALUATION OF TOXIC GAS MONITORS FOR INDOOR AND WORKPLACE AIR

Purpose: By conducting laboratory and field evaluations of portable instrumentation, the project will provide data and information on the application and maintenance of gas monitors in an indoor air or workplace monitoring situation.

DPSE, Jerome P. Smith
CAN 443 Dates: 10/89-09/91

GLYCOL ETHERS CRITERIA DOCUMENT

Purpose: This project will provide a critical evaluation of information on the health risks associated with occupational exposure to ethylene glycol ethers. The evaluation will be used to develop a Criteria Document that will provide criteria for a recommended standard for the prevention/control of occupational exposures to ethylene glycol ethers.

DSDTT, Joann A. Wess
CAN 132 Dates: 10/89-09/90

DISORDERS OF REPRODUCTION

REPRODUCTIVE INITIATIVE

Purpose: This project will set priorities for future research and outline areas requiring methodologic development for reproductive epidemiologic research.

DSHEFS, Teresa M. Schnorr
CAN 544 Dates: 10/88-09/91

IH EXPOSURE ASSESSMENTS IN SELECTED INDUSTRIES

Purpose: This project will fill in data gaps on exposure to agents and locate suitable cohorts for epidemiologic investigations.

DSHEFS, Thomas F. Bloom
CAN 547 Dates: 10/88-C

REPRODUCTIVE STUDY OF FEMALE VIDEO DISPLAY TERMINAL (VDT) OPERATORS

Purpose: This epidemiologic study will assess the association between working with video display terminals and the risk of adverse reproductive outcomes.

DSHEFS, Teresa M. Schnorr
CAN 687 Dates: 10/84-03/90

NEUROTOXIC DISORDERS

HUMAN NEUROBEHAVIORAL EFFECTS OF COMBINATION CHEMICAL EXPOSURES

Purpose: Neurological and behavioral dose-effect characteristics of pairs of common industrial solvents will be evaluated using controlled human exposures. Primary interest will center on the neurotoxic and pharmacokinetic properties.

DBBS, Robert B. Dick
CAN 243 Dates: 10/87-03/92

WHO NEUROTOXICITY METHODS VALIDATION

Purpose: This project is part of an international collaborative effort coordinated by the World Health Organization (WHO) to evaluate the reliability, sensitivity, and specificity of a set of neurobehavioral methods designed to screen, in animals, chemicals that are potential neurotoxic agents in humans.

DBBS, Benjamin K. Nelson
CAN 245 Dates: 10/89-09/91

NEUROBEHAVIORAL ASSESSMENT OF PESTICIDE APPLICATORS

Purpose: Workers exposed to or poisoned by pesticides will be evaluated for neurobehavioral impairment using the WHO-recommended Neurobehavioral Core Test Battery (NCTB), the Neurobehavioral Evaluation System (NES) computerized test battery, and measures specific to detect peripheral neuropathy and cholinesterase (ACHE)/Neurotoxic Esterase (NTE) activity.

DBBS, John M. Russo
CAN 249 Dates: 10/88-09/91

CONTROL OF METHYLENE CHLORIDE IN FURNITURE STRIPPING

Purpose: Recommend controls for methylene chloride, a neurotoxin, carcinogen, and reproductive toxin in furniture stripping. This is an industry made up mostly of small businesses with no occupational health expertise. DSHEFS reports current exposures are very high.

DPSE, Cheryl L. Fairfield
CAN 418 Dates: 10/87-09/91

ANALYTICAL METHOD FOR TOTAL HYDROCARBONS ON CHARCOAL

Purpose: The project will provide improved environmental monitoring methods needed to support exposure surveillance and evaluation studies.

DPSE, Robert A. Lunsford
CAN 438 Dates: 07/88-09/91

MONITORING TECHNIQUES FOR CHEMICAL AGENTS

Purpose: Improved sensitivity monitoring techniques will be evaluated/developed. This includes evaluating/comparing existing methodologies and optimization of analytical procedures. Particular attention will be paid to sampling high relative humidity atmospheres.

DPSE, Judd C. Posner
CAN 449 Dates: 03/87-09/90

NEUROTOXIC DISORDERS

CONTROL OF LEAD EXPOSURES IN INDOOR FIRING RANGES

Purpose: The project will define the exposure control problems that occur under the present recommendations, and then demonstrate the reduction or elimination of these problems, using known principals of ventilation design. Work will be done in the field and in laboratory model studies, in order to generalize the results.

DPSE, Keith G. Crouch
CAN 844 Dates: 10/88-09/90

METHANOL EXPOSURES IN TRANSIT VEHICLES (UMTA)

Purpose: This project will assess the health and safety aspects of using pure methanol as a fuel in transit buses.

DSHEFS, Greg Piacitelli
CAN 502 Dates: 10/88-09/91

NATIONAL REPORTING OF SELECTED OCCUPATIONAL DISEASES

Purpose: This project will provide for the successful implementation of State-based reporting of occupational diseases and will allow for direct monitoring of occupationally related disease, disability, and death. This will improve our surveillance capability.

DSHEFS, Paul J. Seligman
CAN 514 Dates: 10/83-C

AN ASSESSMENT OF THE EFFECTIVENESS OF OSHA'S LEAD STANDARD

Purpose: By identifying industries with current problems controlling lead exposure, surveillance efforts and prevention strategies can be focused to eliminate occupational lead poisoning.

DSHEFS, Paul J. Seligman
CAN 515 Dates: 10/86-09/91

NEUROLOGICAL SEQUELAE OF ACUTE PESTICIDE POISONING

Purpose: This project will seek to determine if there are any long-term neurological effects after organophosphate poisoning.

DSHEFS, Nelson K. Steenland
CAN 530 Dates: 10/89-09/93

STUDY OF METHYL BROMIDE AND SULFURYL FLUORIDE APPLICATORS

Purpose: This project will assess the effects of Methyl bromide and Sulfuryl Fluoride on target organs (nervous system and kidney) and develop biological monitoring techniques for both.

DSHEFS, Anthony Suruda
CAN 535 Dates: 10/89-06/92

NEUROTOXIC DISORDERS

DIOXIN MORBIDITY AND REPRODUCTIVE STUDY OF U.S. CHEMICAL WORKERS

Purpose: This epidemiologic study will assess the association between exposure to dioxin and the risk of developing disease, including neurologic disease, and dermatologic conditions.

DSHEFS, Marie Haring Sweeney
CAN 849 Dates: 10/84-09/90

EVALUATE FIELD CPC PERMEATION METHOD FOR FURNITURE STRIPPING INDUSTRY

Purpose: This project will evaluate an inexpensive permeation method suitable for the level of expertise found in small businesses. CPC recommendations will be made for two chemical mixtures used in furniture stripping.

DSR, Michael M. Roder
CAN 833 Dates: 10/89-09/90

NOISE-INDUCED HEARING LOSS

HEARING CONSERVATION PROGRAMS FOR UNDERSERVED WORKER GROUPS

Purpose: This project will develop models for effective hearing conservation in occupations (agriculture/construction) which pose unique problems in implementing efforts to protect workers' hearing. Equipment noise control options, innovative hearing monitoring systems, and selection of hearing protectors will be considered for adoption in the model programs.

DBBS, Alice H. Suter
CAN 262 Dates: 10/89-09/92

IMPACT NOISE EFFECTS ON HEARING IN LABORATORY ANIMALS

Purpose: The project will analyze available information, identify critical information gaps, and collect data to define the relationship between auditory damage and exposure to the parameters of impulse and impact noise (e.g., peak pressure, spectrum, duration, rise time, etc.). These data can be used to develop criteria for impact noise exposure.

DBBS, Derek E. Dunn
CAN 264 Dates: 10/89-09/92

NOISE-INDUCED HEARING LOSS: SUPPORT FOR FFHH SURVEY

Purpose: Project will provide training and support to NIOSH and extramural personnel in the collection of data relating to noise exposure and noise-induced hearing loss among agricultural workers. The project will also involve assisting in follow-back investigations and hearing health promotion activities.

DBBS, Alice H. Suter
CAN 265 Dates: 10/89-09/92

OCCUPATIONAL IMPACT NOISE: EXPOSURE, EFFECT, AND CONTROL

Purpose: The project will provide a direct comparison of hearing between groups of workers exposed to impact noise or continuous noise. The results will help determine whether separate criteria are needed to adequately protect the hearing of workers exposed to impact noise versus continuous noise.

DBBS, John R. Franks
CAN 359 Dates: 10/88-09/91

OPTIMIZATION OF SPEECH FOR COMMUNICATIVE/PROTECTIVE DEVICES

Purpose: This project will establish important parameters for the development of innovative hearing protectors that promote better communication. Communication interference is a primary reason workers refuse to wear hearing protection.

DBBS, John R. Franks
CAN 364 Dates: 10/87-09/90

OCCUPATIONAL NOISE EXPOSURE POSITION PAPER

Purpose: This project will provide a critical evaluation of recent information on the health risks from occupational exposure to noise. The evaluation will be used to develop a position paper that will provide a recommendation to the OD, NIOSH, concerning the need to revise the Institute's Criteria Document on noise.

DSDTT, Henry Chan
CAN 134 Dates: 10/89-09/90

NOISE-INDUCED HEARING LOSS

STATE FARM FAMILY HEALTH AND HAZARD SURVEY (FFHHS)

Purpose: This project will provide the necessary funds to State agencies conducting farm family health and hazard surveys. This project will develop and implement the necessary cooperative agreements.

DSHEFS, John Sestito
CAN 549 Dates: 10/89-C

SURVEY INSTRUMENT DESIGN: HEALTH HISTORY EXAMINATION

Purpose: This project will develop models for the survey instruments to be used by the States for data collection. With NCHS, NIOSH will develop these models from existing survey instruments and will evaluate their use.

DSHEFS, Lorraine L. Cameron
CAN 559 Dates: 10/89-10/91

FARM HEALTH HAZARD AWARENESS

Purpose: This project will undertake a number of high profile initiatives in the agriculture sector, including direct mailings, attendance at State fairs, media events to promote awareness as to preventable farm hazards.

DSHEFS, Paul J. Seligman
CAN 563 Dates: 10/89-09/90

DERMATOLOGICAL CONDITIONS

SKIN DEPIGMENTATION AMONG RUBBER WORKERS

Purpose: This project will develop an alert, in conjunction with DSHEFS that identifies the high risk job categories and associated causal factors for skin depigmentation among rubber workers. The alert will make recommendation for preventing such skin depigmentations.

DSDTT, Laurence D. Reed
CAN 090 Dates: 10/89-09/90

PERCUTANEOUS EXPOSURE TO ORGANIC SOLVENTS ALERT

Purpose: This project will develop an alert in conjunction with DSR that identifies the causal factors associated with percutaneous absorption of organic solvents. The alert will make recommendations for preventing such exposures.

DSDTT, Laurence D. Reed
CAN 115 Dates: 10/89-09/91

CUTTING FLUIDS POSITION PAPER

Purpose: This project will provide a critical evaluation of information on the health risks associated with exposure to cutting fluids. The evaluation will be used to develop a position paper that will provide a recommendation to the OD, NIOSH concerning the need to develop a document (e.g., CD, CIB) addressing the hazards of exposure.

DSDTT, Brenda K. Boutin
CAN 140 Dates: 10/89-12/90

ANALYSIS OF HEALTH INTERVIEW SURVEY DATA

Purpose: This project will continue the surveillance of employment-related morbidity to help achieve the goal of identifying and monitoring employment-related health effects in the U.S. worker population and help establish priorities for NIOSH research.

DSHEFS, Virginia Behrens
CAN 508 Dates: 10/83-09/90

IDENTIFICATION OF NEW DERMATOLOGICAL HAZARDS IN AGRICULTURE

Purpose: This project will identify occupations/processes within the farming community in which the prevalence of skin diseases is high and from this identify new chemicals/other exposures which cause work-related skin disorders. Intervention strategies will be suggested where possible.

DSHEFS, Paul J. Seligman
CAN 564 Dates: 10/89-09/92

SAFETY COMPONENTS OF SMALL BUSINESS INITIATIVE

Purpose: This project will enable DSR to collaborate with other NIOSH divisions in identifying hazards associated with sheltered workshops and in developing intervention strategies to use in recommending ways to reduce dermal and respiratory exposures and minimize musculoskeletal injuries.

DSR, Alfred A. Amendola
CAN 804 Dates: 10/88-C

DERMATOLOGICAL CONDITIONS

CHARACTERIZATION OF HOLES IN GLOVES

Purpose: This project will produce and characterize small holes in the range of 50 to 300 microns in protective materials and determine the relationship of penetration rate of chemicals as a function of hole size. Latex gloves have been shown to have defect (pin hole) rate of 1.7 To 9 percent among brands/styles.

DSR, Ronald L. Mickelsen
CAN 886 Dates: 10/88-09/91

URBAN MASS TRANS. ADMIN./NIOSH IAG ON METHANOL FUEL

Purpose: This project will provide guidance to workers and employers for the safe handling of methanol and methanol-gasoline fuels used to replace less dangerous diesel and gasoline fuels.

DSR, Michael M. Roder
CAN 890 Dates: 10/88-09/90

GRANTS ADMINISTRATION (GRADS)

Purpose: This project will specifically address Section 21 of the OSH Act which calls for an adequate supply of qualified personnel to carry out the purposes of the act. It supports academic programs by building the OSH professional workforce for implementation of the NIOSH strategies.

DTMD, John T. Talty
CAN 764 Dates: 10/88-C

PSYCHOLOGICAL DISORDERS

OCCUPATIONAL INCIDENCE OF STRESS DISORDERS

Purpose: The suitability of social security disability databases for surveillance of Occupational Psychological Disorders will be determined.

DBBS, Lawrence R. Murphy
CAN 240 Dates: 10/83-09/90

METHODS FOR RATING JOB STRESS/STRAIN

Purpose: Improved methods for assessing stress factors for purposes of detecting stressful job conditions and promoting more uniform approaches to assessing job stress and strain will be developed.

DBBS, Joseph J. Hurrell
CAN 242 Dates: 10/83-09/91

ELECTRONIC PERFORMANCE MONITORING: STRESS PREVENTION STRATEGIES

Purpose: Job and organizational factors that contribute to stress in electronic performance monitoring (EPM) will be investigated and work design solutions will be formulated.

DBBS, Lawrence M. Schleifer
CAN 247 Dates: 10/88-09/92

STRESS CONTROL STRATEGIES IN COMPUTER-MEDIATED WORK

Purpose: Laboratory and field studies will be conducted to determine the usefulness of rest breaks and exercise for reducing stress, and to recommend improved rest break designs for implementation in the workplace.

DBBS, Steven L. Sauter
CAN 256 Dates: 10/85-09/91

DEVELOPMENT OF SURVEY ASSESSMENT INSTRUMENT FOR IAQ

Purpose: An item pool for defining self-report measures of job demands and environmental work conditions will be developed. Such items will be proposed for inclusion in protocols for studying Indoor Air Quality problems where apparent health complaints may be due to interaction among perceived job stressors and air quality factors.

DBBS, Joseph J. Hurrell
CAN 257 Dates: 10/88-09/91

IMMUNOTOXIC AND SUPPORT

Purpose: This project will develop and employ immunoassays as molecular and cellular probes for use in pathogenesis studies of cancer and neuroendocrine based disorders, and in determining the relevance of immune competence to disease resistance. The assays will be applied to NIOSH research and field studies requiring immunology input.

DBBS, Gerry M. Henningsen
CAN 342 Dates: 10/88-C

ASSISTANCE REQUESTS

TECHNICAL ASSISTANCE AND PROGRAM SUPPORT (PSYCHOLOGY/ERGONOMICS)

Purpose: Assures program planning, budget management, and staff development to conduct research, methods development, control studies, consultations and evaluations as prescribed in prevention strategies in work-related musculoskeletal injuries, neurotoxic and psychological disorders.

DBBS, Robert J. Biersner
CAN 284 Dates: 10/80-C

TECHNICAL ASSISTANCE AND PROGRAM SUPPORT (TOXICOLOGY)

Purpose: Effect plans and manage resources for toxicology research and methods development which implement the national prevention strategies and NIOSH initiatives; furnish support to NTP and other public health programs requiring toxicology expertise.

DBBS, Russell E. Savage
CAN 348 Dates: 10/86-C

TECHNICAL ASSISTANCE AND PROGRAM SUPPORT (PHYSICAL AGENTS)

Purpose: The project will provide management and guidance for the implementation of the national prevention strategies as well as consultation involving investigative research, instrument/methods development, and personal protective equipment.

DBBS, James M. Smith
CAN 374 Dates: 10/83-C

TECHNICAL ASSISTANCE AND PROGRAM SUPPORT (BIOLOGY/CHEMISTRY)

Purpose: This project will provide technical assistance and support for investigative research, methods development, and biological and immunological assay activities related to implementation of the national prevention strategies and plan/manage branch programs and resources directed to such needs.

DBBS, Lloyd E. Stettler
CAN 390 Dates: 10/80-C

QUALITY ASSURANCE OF ANALYTICAL MEASUREMENTS

Purpose: This project will expand the internal quality assurance program to insure the quality of analytical data generated internally and by MRSB contract laboratories.

DPSE, Peter M. Eller
CAN 420 Dates: 10/85-C

METHODS FOR EVALUATING INDOOR AIR VENTILATION SYSTEMS

Purpose: This project will develop and document procedures to effectively evaluate building ventilation systems and to provide the necessary information to correct the problems.

DPSE, Mazen Y. Anastas
CAN 442 Dates: 10/88-09/91

ASSISTANCE REQUESTS

RESPIRATORY DISEASE HEALTH HAZARD EVALUATION AND TECHNICAL ASSISTANCE

Purpose: This project responds to health concerns of miners in coal, metal and non-metal mines and of workers in general industry with respiratory related complaints. This project will address the division objective to increase the number of completed HHE/TA's by effectively responding to requests for health hazard evaluations.

DRDS, John E. Parker
CAN 153 Dates: 10/87-C

800 TELEPHONE INFORMATION SERVICE

Purpose: This project will provide to the public free access to NIOSH information resources and to the HETA program.

DSDTT, Raymond Ruhe
CAN 149 Dates: 10/89-C

HEALTH HAZARD EVALUATIONS AND TECHNICAL ASSISTANCE

Purpose: Investigations result in recommendations relating to the national strategies, NIOSH research efforts.

DSHEFS, Robert A. Rinsky
CAN 688 Dates: 10/80-C

HEALTH HAZARD ASSESSMENT AT SUPERFUND SITES

Purpose: Characterization of toxic airborne and skin exposures among persons employed at hazardous waste sites will aid ATSDR/EPA in resolving the related public health issues.

DSHEFS, Richard Gorman
CAN 897 Dates: 10/84-C

ADMINISTRATION

DBBS ADMINISTRATION

Purpose: Expedition, intervention, or reallocation of expenditures by four branches is provided. Personnel utilization is evaluated and considered when assigning special tasks and allocating positions. Responses to requests for technical assistance are assigned to available personnel and expedited through a tracking system.

DBBS, Janet C. Haartz
CAN 303 Dates: 10/76-C

ADMINISTRATIVE SUPPORT FOR DPSE RESEARCH

Purpose: This project will, in addition to providing strategy implementation, develop criteria for monitoring, and assessing control technology through research and development. Provides for the Institute's chemical analysis needs and operates a quality control reference program for analytical laboratories.

DPSE, Philip J. Bierbaum
CAN 402 Dates: 10/85-C

OFFICE OF THE DIRECTOR - DIVISION MANAGEMENT

Purpose: Provide management and guidance for the implementation of the National Prevention Strategies involving investigative research, environmental and medical surveillance.

DRDS, Gregory R. Wagner
CAN 103 Dates: 10/86-C

PROGRAM MANAGEMENT

Purpose: This project will provide management and guidance for the implementation of the ten National Prevention Strategies. This project is primarily directed toward increasing the number and quality of documents and other NIOSH policy statements produced annually through management of resources and dissemination of information.

DSDTT, Richard W. Niemeier
CAN 082 Dates: 10/70-C

TECHNOLOGY TRANSFER

Purpose: This project will extend access to NIOSH-developed databases worldwide by monitoring memoranda of agreements and memoranda of understanding for NIOSH information services. These agreements provide for access to our databases by persons outside of NIOSH.

DSDTT, Vivian K. Morgan
CAN 084 Dates: 10/83-C

CONSULTATION AND BRANCH ADMINISTRATION: DOCUMENT DEVELOPMENT BRANCH

Purpose: This project will provide administrative, consultative, statistical, and technical assistance for implementation of the ten National Prevention Strategies.

DSDTT, Bryan D. Hardin
CAN 094 Dates: 10/84-C

ADMINISTRATION

TECHNICAL MANAGEMENT - DSHEFS, (OD)

Purpose: This project will provide technical and managerial guidance for the implementation of the National Prevention Strategies. In addition to surveillance, industrywide studies, and hazard evaluations, efforts will be developed to intervene in certain situations so as to reduce workplace hazards.

DSHEFS, Lawrence J. Fine
CAN 522 Dates: 10/80-C

TECHNICAL MANAGEMENT

Purpose: This project supports statistical and data processing aspects of DSHEFS' industrywide studies, health hazard evaluations, and surveillance activities. It also provides biomedical instrumentation support to all Cincinnati NIOSH operations.

DSHEFS, Lawrence R. Catlett
CAN 680 Dates: 10/87-C

DIVISION ADMINISTRATION AND COLLABORATIVE NETWORKS

Purpose: This project will provide management and guidance for the implementation of the National Prevention Strategies involving work force development, health promotion and support to academic programs.

DTMD, Thomas C. Purcell
CAN 763 Dates: 10/88-C

OTHER

STATISTICAL SUPPORT TO DBBS

Purpose: Support personnel, equipment, and training are provided to increase the quality and quantity of support given to division project officers in design, implementation, and analyses of planned projects.

DBBS, Stephen D. Simon
CAN 305 Dates: 10/85-C

BIOLOGICAL MONITORING RESEARCH AND SUPPORT

Purpose: This project will provide biological monitoring support, including the development and application of new methods to implement research strategies in DSHEFS and DBBS. Support activities will be conducted in-house and by BPA labs. Biological monitoring methods will be evaluated in the field in collaboration with DSHEFS staff.

DBBS, Alexander W. Teass
CAN 378 Dates: 10/80-C

STATISTICAL SUPPORT FOR DPSE RESEARCH

Purpose: Experiments will be designed using statistics, and data will be statistically analyzed to support DPSE research projects.

DPSE, Thomas J. Fischbach
CAN 407 Dates: 10/85-C

AGRICULTURAL HEALTH AND SAFETY DISSEMINATION

Purpose: This project will enable NIOSH material to be disseminated to appropriate employers and employees in the agricultural industry.

DSDTT, Janice Huy
CAN 073 Dates: 10/89-C

CONSTRUCTION HEALTH AND SAFETY DISSEMINATION

Purpose: This project will enable NIOSH materials to be disseminated to appropriate employers and employees in the construction industry.

DSDTT, Janice Huy
CAN 075 Dates: 10/89-C

TECHNICAL INQUIRIES - CONSTRUCTION

Purpose: This project will improve the delivery of occupational safety and health information to researchers, employers and employees.

DSDTT, Rodger Tatken
CAN 076 Dates: 10/89-C

OTHER

LIBRARY-CONSTRUCTION REFERENCES

Purpose: This project will improve the delivery of occupational safety and health information to NIOSH researchers and the occupational safety and health community.

DSDTT, Janice Huy
CAN 079 Dates: 10/89-C

LIBRARY SERVICES

Purpose: This project maintains the collection and provides better services from the Cincinnati facilities libraries.

DSDTT, Larry Q. Foster
CAN 083 Dates: 10/83-C

SUMMARY OF NIOSH RECOMMENDATIONS FOR OSH - MMWR

Purpose: This project will provide a listing of all NIOSH policy documents (e.g., Criteria Documents, current intelligence bulletins, testimonies, and submissions made to OSHA and MSHA for rulemaking).

DSDTT, Barbara L. Dames
CAN 086 Dates: 10/89-09/91

RESPONSES TO REGULATORY ACTIVITIES

Purpose: This project will provide for coordination of activities by NIOSH, DOL/OSHA/MSHA standards development staff in making recommendation for work place standards through the DOL/OSHA/MSHA rulemaking process. The most current information developed by or available to NIOSH is used to develop public testimony and make recommendations to DOL/OSHA/MSHA.

DSDTT, Laurence D. Reed
CAN 087 Dates: 10/83-C

SENIOR REVIEW ACTIVITIES

Purpose: This project will provide a multidisciplinary team of senior scientists who will evaluate scientific and policy issues to ensure the accuracy and scientific quality of documents and the appropriate consideration of policy implications. This review will provide for the implementation of all of the National Prevention Strategies.

DSDTT, William D. Wagner
CAN 092 Dates: 10/87-C

NIOSH INFORMATION SYSTEMS

Purpose: This project will make available technical information through current, computerized databases to NIOSH personnel and the OSH community. Principal systems include the Document Information System (DIDS), and the NIOSH Mailing List (NMLS).

DSDTT, Rolland R. Rogers
CAN 095 Dates: 10/70-C

OTHER

REGISTRY OF TOXIC EFFECTS OF CHEMICAL SUBSTANCES (RTECS)

Purpose: This project will deliver toxicological data to serve the information needs of the occupational safety and health community and to produce innovative changes to assist users.

DSDTT, Doris V. Sweet
CAN 096 Dates: 10/70-C

NIOSHTIC

Purpose: This project will assist the research and technical assistance activities of NIOSH and the occupational safety and health community as a whole. This system currently contains over 159,000 citations derived from the world's occupational safety and health literature.

DSDTT, William D. Bennett
CAN 097 Dates: 10/70-C

PUBLICATION AND DISSEMINATION OF NIOSH PUBLICATIONS

Purpose: This project will provide for dissemination of occupational safety and health information in support of NIOSH research and in response to public inquiries. In addition, NIOSH-developed technologies will be presented through the exhibit program.

DSDTT, Charlene B. Maloney
CAN 098 Dates: 10/83-C

INFORMATION RETRIEVAL AND ANALYSIS

Purpose: This project will provide technical information services to Institute personnel in support of research and public hearings, and to the public requesting information on OSH issues. It also provides for the development of chemical occupational safety and health information packages.

DSDTT, Rodger L. Tatken
CAN 099 Dates: 10/70-C

INTERNATIONAL PROGRAMME FOR CHEMICAL SAFETY (IPCS) CARDS

Purpose: This project will develop 25 chemical safety cards each year for the next three years as a joint effort with the International Programme on Chemical Safety (IPCS), World Health Organization (WHO).

DSDTT, Howard R. Ludwig
CAN 118 Dates: 10/89-09/92

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS

Purpose: . This project will update the existing information in the pocket guide and list an additional 200 chemicals with NIOSH RELS and/or OSHA PELS.

DSDTT, Howard R. Ludwig
CAN 120 Dates: 10/89-C

OTHER

INTERIM-RECOMMENDED EXPOSURE LIMITS (I-RELS) GUIDELINES

Purpose: This project will develop criteria for assessing the quality of industrial hygiene, clinical, medical, and epidemiological data, and will develop guidelines for the extrapolation of health effects data.

DSDTT, Howard R. Ludwig
CAN 122 Dates: 10/89-C

IMMEDIATELY DANGEROUS TO LIFE OR HEALTH (IDLHS) CONCENTRATIONS

Purpose: This project will formulate criteria for selecting IDLHS for chemicals that currently have none assigned.

DSDTT, Howard R. Ludwig
CAN 125 Dates: 10/89-09/91

CONSTRUCTION TRADES - MORTALITY STUDIES

Purpose: PMR analyses will be used to identify high mortality risks as leads to in-depth epidemiologic studies of exposure disease relationships.

DSHEFS, Robert Roscoe
CAN 578 Dates: 10/89-09/92

OCCUPATIONAL MORTALITY SURVEILLANCE VALIDATION

Purpose: The project will attempt to evaluate the validity of mortality surveillance efforts presently conducted by DSHEFS.

DSHEFS, Carol Burnett, Cynthia Robinson
CAN 639 Dates: 10/89-09/92

COMPARATIVE OCCUPATIONAL MORTALITY ANALYSIS

Purpose: This project will compare results from occupational mortality surveillance studies to (1) assess the extent to which associations are observed consistently in different populations and different time periods; and (2) generate hypotheses for further research.

DSHEFS, Nina Lalich, Joyce Salg
CAN 640 Dates: 10/89-09/91

SAFETY DIVISION MANAGEMENT

Purpose: This project will provide management and guidance for the implementation of the National Prevention Strategies involving investigative research, information dissemination/document development, respirators, surveillance, and other epidemiological studies.

DSR, Thomas R. Bender
CAN 802 Dates: 06/77-C

NIOSH PROJECTS BY DIVISION

DIVISION OF BIOMEDICAL AND BEHAVIORAL SCIENCE (DBBS)

		CAN	PAGE
OCCUPATIONAL LUNG DISEASES			
1.	Evaluation of Mesothelioma Production by Asbestos Substitutes	376	59
MUSCULOSKELETAL INJURIES			
2.	Ergonomic Risks from Tool Usage and Design	244	81
3.	Biodynamics of Frequent Asymmetric Lifting	246	81
4.	Appraisal/Expansion of Manual Materials Handling Limits	252	81
5.	Shoulder/Neck Muscle Tension for Repetitive Work	260	81
6.	Biomolecular Markers of Chronic Trauma	344	81
OCCUPATIONAL CANCERS			
7.	Inhibition of Intercellular Communication by Workplace Chemicals	288	85
8.	Temporal Factors Influencing Carcinogenicity of Industrial Chemicals	313	85
9.	Biological Monitoring for Aryl Amines	314	85
10.	Immunological Markers of Herbicide Exposure	343	85
11.	Inhalation Toxicology and Research Support	379	85
12.	Animal Husbandry Services	385	85
13.	Diagnostic and Research Pathology	386	86

DIVISION OF BIOMEDICAL AND BEHAVIORAL SCIENCE (DBBS)

OCCUPATIONAL CARDIOVASCULAR DISEASES

		CAN	PAGE
14.	Cellular and Molecular Cardiac Toxicology	285	102

ASSISTANCE REQUESTS

		CAN	PAGE
15.	Technical Assistance and Program Support (Psychology/Ergonomics)	284	114
16.	Technical Assistance and Program Support (Toxicology)	348	114
17.	Technical Assistance and Program Support (Physical Agents)	374	114
18.	Technical Assistance and Program Support (Biology/Chemistry)	390	114

DISORDERS OF REPRODUCTION

		CAN	PAGE
19.	Combined Chemical/RF Radiation Teratogenesis	263	103
20.	Methods for Assessing Reproductive Potential in Females	287	103
21.	Methods for Determining Evidence of Mutations During Spermatogenesis	289	103
22.	Semen Analysis in Animal, Longitudinal and Field Studies	307	103
23.	In Vitro Systems for Human Biological Monitoring	317	103
24.	Amelioration of RF Exposures in the Dielectric Heating Industry	356	103
25.	Epidemiologic Study of Radiofrequency Heater Operators	358	104
26.	RF-Induced Body Current and Absorbed Power Determinations	363	104

DIVISION OF BIOMEDICAL AND BEHAVIORAL SCIENCE (DBBS)

		CAN	PAGE
27.	Particulate and Tissue Analysis Research and Service	387	104

NEUROTOXIC DISORDERS

		CAN	PAGE
28.	Human Neurobehavioral Effects of Combination Chemical Exposures	243	106
29.	WHO Neurotoxicity Methods Validation	245	106
30.	Neurobehavioral Assessment of Pesticide Applicators	249	106

NOISE-INDUCED HEARING LOSS

		CAN	PAGE
31.	Hearing Conservation Programs for Underserved Worker Groups	262	109
32.	Impact Noise Effects on Hearing in Laboratory Animals	264	109
33.	Noise-Induced Hearing Loss: Support for FFHH Survey	265	109
34.	Occupational Impact Noise: Exposure, Effect, and Control	359	109
35.	Optimization of Speech for Communicative/Protective Devices	364	109

PSYCHOLOGICAL DISORDERS

		CAN	PAGE
36.	Occupational Incidence of Stress Disorders	240	113
37.	Methods for Rating Job Stress/Strain	242	113
38.	Electronic Performance Monitoring: Stress Prevention Strategies	247	113
39.	Stress Control Strategies in Computer-Mediated Work	256	113

DIVISION OF BIOMEDICAL AND BEHAVIORAL SCIENCE (DBBS)

CAN PAGE

40. Development of Survey Assessment Instrument for IAQ 257 113

41. Immunotoxic and Support 342 113

ADMINISTRATION

42. DBBS Administration 303 116

OTHER

43. Statistical Support to DBBS 305 118

44. Biological Monitoring Research and Support 378 118

DIVISION OF PHYSICAL SCIENCES AND ENGINEERING (DPSE)

OCCUPATIONAL LUNG DISEASES

		CAN	PAGE
1.	Control Technology for NIOSH Surveillance Activities	404	59
2.	Dust Control for Falling Solids	406	59
3.	Asbestos Removal Control Technology Assessment	408	59
4.	Implement Asbestos Controls during Brake Shoe Replacement	409	59
5.	Asbestos Analysis Surveillance Program	412	59
6.	Analytical Methods for Inorganic Substances	413	60
7.	Halogen Gases S/A Methods	414	60
8.	Technology Transfer for DPSE Projects	416	60
9.	Control of Ammonia Releases in Agricultural Applications	423	60
10.	HHE Analytical Chemistry Support	425	60
11.	Mining and Respiratory Disease Research Analytical Support	426	60
12.	Pilot Study; Evaluation of Process Containment for Bioaerosols	429	61
13.	A Method for Sampling and Analysis of Indoor Air for Organic Compounds	430	61
14.	A National Construction Industry Control Technology Database	434	61
15.	Analytical Methods for Organic Compounds	437	61
16.	Determination of Formaldehyde Content of Airborne Dust	439	61

DIVISION OF PHYSICAL SCIENCES AND ENGINEERING (DPSE)

		CAN	PAGE
17.	Revision of the NIOSH Manual of Analytical Methods	445	61
18.	Analytical Methods for Asbestos Fibers	448	62
19.	Particle Sampler Performance Testing	455	62
20.	Quality Assurance (External)	458	62
21.	Maintenance and Calibration	459	62
22.	Dev. Of Predictive Models for Determining Control Effectiveness	494	62
23.	Gas and Vapor Measurement Techniques	496	62
24.	Development of Emission Controls for Laser Processes	843	63

MUSCULOSKELETAL INJURIES

25.	Development of an Intervention Model for Musculoskeletal Injuries	422	81

OCCUPATIONAL CANCERS

26.	Applied Control Technology Studies	403	86
27.	Control Technology for Small Business	415	86
28.	Control of Formaldehyde Exposures in Embalming Procedures	417	86
29.	A Sampling and Analytical Method for Airborne Diesel-Exhaust Particles	432	86
30.	Chemical Characterization of Roofing Asphalt Fume	433	86
31.	Analysis of Exhaled Breath	435	87
32.	Portable Mass Spectrometer or FTIR Evaluation	444	87

DIVISION OF PHYSICAL SCIENCES AND ENGINEERING (DPSE)

		CAN	PAGE
33.	Engineering Control Assistance	446	87
34.	SENSOR Development	447	87
35.	Applied Monitoring Studies	456	87
36.	Comprehensive Analytical Chemistry Services	482	87
37.	Analytical Support to DBBS Research and IWSB/DSHEFS	483	88
38.	Analytical Chemistry Support to DPSE Research	484	88
39.	Control of Particulate and Gaseous Agents by Air Curtain Technology	492	88

OCCUPATIONAL CARDIOVASCULAR DISEASES

40.	Expansion of Direct Reading Instrumentation Capabilities	497	102

ASSISTANCE REQUESTS

41.	Quality Assurance of Analytical Measurements	420	114
42.	Methods for Evaluating Indoor Air Ventilation Systems	442	114

DISORDERS OF REPRODUCTION

43.	Control of Anesthetic Gases in Dental Operatories	405	104
44.	Evaluation of Toxic Gas Monitors for Indoor and Workplace Air	443	104

DIVISION OF PHYSICAL SCIENCES AND ENGINEERING (DPSE)

NEUROTOXIC DISORDERS

		CAN	PAGE
45.	Control of Methylene Chloride in Furniture Stripping	418	106
46.	Analytical Method for Total Hydrocarbons on Charcoal	438	106
47.	Monitoring Techniques for Chemical Agents	449	106
48.	Control of Lead Exposures in Indoor Firing Ranges	844	107

ADMINISTRATION

		CAN	PAGE
49.	Administrative Support for DPSE Research	402	116

OTHER

		CAN	PAGE
50.	Statistical Support for DPSE Research	407	118

DIVISION OF RESPIRATORY DISEASE STUDIES (DRDS)

OCCUPATIONAL LUNG DISEASES

		CAN	PAGE
1.	Pulmonary Response to Cotton Dust	102	63
2.	Endotoxin Detection in Cotton Dust	104	63
3.	Comparative Research in Analytical Pathology	105	63
4.	Induction of DNA-Adduct in the Lungs by Industrial Chemicals	106	63
5.	Effect of Silica Exposure on the Lung: Biochem/Path Studies	113	63
6.	Assessment of the Carcinogenic Potential of Selected Dusts	116	64
7.	Occupational Asthma and the Role of Airway Epithelium	119	64
8.	Animal and Exposure Facility Support for DRDS	123	64
9.	Validation Studies of in Situ Assay Systems in Occupational Setting	124	64
10.	Agriculture: Chronic Bronchitis Studies	126	64
11.	Centers for Agricultural Research, Education, Disease and Injury	130	64
12.	NHANES III Support	135	65
13.	Prevention of Silicosis in Foundry Workers	137	65
14.	Microbial Exposures in Agriculture	147	65
15.	Inflammatory Agents in Agricultural Dusts	148	65
16.	Role of Fungal Spores in Organic Dust Toxic Syndrome (ODTS)	150	65

DIVISION OF RESPIRATORY DISEASE STUDIES (DRDS)

		CAN	PAGE
17.	Emerging Technology for Respiratory Disease Evaluations	152	65
18.	Evaluation of Role of Interferon System in OCC Asthma Assoc w/ Ag Dust	154	66
19.	State-Based Surveillance: Medical Technical Support	155	66
20.	Pneumoconiosis X-Ray Interpretation Using Computed Image Modification	156	66
21.	Agricultural Lung Disease Program Peer Review: Technical Support	157	66
22.	Emerging Problems in Occupational Respiratory Disease	158	66
23.	Silicosis Surveillance: Mortality and Morbidity Trends	159	66
24.	Development of Bioassays: Identify Health Risks of Asbestos Substitutes	160	67
25.	Surveillance of Lung Disease Agents in Small Businesses	162	67
26.	Agricultural Dust: Elucidation Disease Mech. w/Animal Model, Biomarkers	163	67
27.	National Occupational Health Survey of Mining	164	67
28.	Agricultural Dusts: Animal Models of Asthma	165	67
29.	Effective Silica Indices for Respirable Mineral Dust	167	67
30.	North Carolina Dusty Trades File	172	68
31.	Environmental Hazard Surveillance	173	68
32.	CWP Surveillance Summary Reports	174	68
33.	Technical and Statistical Support	176	68

DIVISION OF RESPIRATORY DISEASE STUDIES (DRDS)

		CAN	PAGE
34.	Silicosis and Cancer in Metal Miners	177	68
35.	Radiological/Pathological Correlation in CWP	178	68
36.	Silicosis in Surface Miners Examined in Surveillance Program	180	69
37.	Medical Field Team Technical Support	182	69
38.	National Study of CWP and Related Research	183	69
39.	Identification of Longwall Miners for Assessment/Prevention of CWP	184	69
40.	Coal Miner Medical Surveillance: Mortality and Morbidity Trends	185	69
41.	Occupational Respiratory Disease Surveillance in Agriculture	186	69
42.	Endotoxin Exposure/Acute Respiratory Effects in Agricultural Workers	187	70
43.	Silicosis Risk in the Construction Industry	188	70
44.	Health Risk of Exposure to Asbestos Substitutes in Insulation Work	189	70
45.	Farm Family Survey: Respiratory Disease Technical Support	190	70
46.	Medical Technical Support	202	70
47.	Byssinosis Prevention	205	70
48.	Airways Disease in Miners	212	71
49.	Occupational Asthma Identification Methods	213	71
50.	Analysis of Data from an Egyptian Silica Study: USAID	214	71

DIVISION OF RESPIRATORY DISEASE STUDIES (DRDS)

		CAN	PAGE
51.	Agricultural Dusts: Field-Based Evaluation-Exposure Acute Resp. Illness	215	71
52.	Rural Hospital Nurses: Respiratory Disease Technical Support	216	71
53.	Evaluation/Rehabilitation of Occupational Resp. Disease Injury	217	71
54.	Hazard Surveillance in the Construction Industry	218	72
55.	Industrial Hygiene Technical Support	223	72
56.	Bias in Particulate Exposure Sampling Devices	224	72
57.	Fiber Toxicity: Surface Properties and Analysis	225	72
58.	Environmental Surveillance of Small Coal Mines	226	72
59.	Pilot Environmental Surveillance of Endotoxin at Selected Cotton Gins	227	72
60.	Evaluation Support to NIOSH Coalworkers' Surveillance Program	228	73
61.	"B" Reader Program: Evaluation and Modification	229	73
62.	Computer Support	232	73
63.	Autopsy Program: Program Operation	233	73
64.	Coal Miner Medical Surveillance: Receiving Center Operation	235	73
65.	Diesel Particulate Measurements	236	73
66.	Respirable Genotoxic Particulate Exposure Measurement Monitoring	237	74

DIVISION OF RESPIRATORY DISEASE STUDIES (DRDS)

		CAN	PAGE
67.	Where's the Endotoxin?	238	74
68.	Silica Exposures of NSCWP Selected Mines	239	74

ASSISTANCE REQUESTS

		CAN	PAGE
69.	Respiratory Disease Health Hazard Evaluation and Technical Assistance	153	115

DIVISION OF SURVEILLANCE, HAZARD EVALUATION, AND FIELD STUDIES (DSHEFS)

OCCUPATIONAL LUNG DISEASES

		CAN	PAGE
1.	Access to OSHA Inspection Data	504	75
2.	An Epidemiologic Study of IAQ	527	75
3.	Cohort Mortality Study of Antimony Smelter Workers	533	75
4.	Mortality Study of Workers Exposed to Toluene Diisocyanate	534	75
5.	Case-Control Study of Lung Cancer in Teamsters Union	539	76
6.	Laborer's Union Health Program	558	76
7.	Uranium Miners-Low Dose Investigation	567	76
8.	Beryllium Retrospective Cohort Investigation	583	76

MUSCULOSKELETAL INJURIES

		CAN	PAGE
9.	Intervention Program - Musculoskeletal Disorders/Meat Packers	517	82
10.	Sentinel Health Event Follow-Back	518	82
11.	P.C. Version of Life Table Analysis System	526	82
12.	Evaluation of Upper Extremity Musculoskeletal Disorders	528	82
13.	National Estimate of Work-Related Cumulative Trauma Disorders	546	83
14.	Surveyor Training	566	83
15.	Rural Hospital Disease/Injury Surveillance and Follow-back	568	83
16.	Disability Surveillance of Occupation and Industry	629	83

DIVISION OF SURVEILLANCE, HAZARD EVALUATION, AND FIELD STUDIES (DSHEFS)

OCCUPATIONAL CANCERS

		CAN	PAGE
17.	Case-Control Surv. to Test Hypotheses Generated by Computer Maps	509	89
18.	Industrywide Study of Workers Exposed to 4,4′-Methylene Dianiline	512	89
19.	Mortality and I.H. Study of Automotive Wood Die and Model Makers	516	89
20.	Estimation of Exposures and Releases from Unit Operations	519	90
21.	Registry of Dioxin Workers and Mortality Study	525	90
22.	Environmental Health Assessment of Exposure to Alachlor-Enhancement	529	90
23.	Epidemiologic Methods Development	532	90
24.	Mortality Study of Workers Exposed to Halowax	536	90
25.	Epi. Study of Bladder Cancer Among Workers Exposed to O-tol. O-aniline	537	90
26.	Update of Completed Cohort Mortality Studies	542	91
27.	Medical, Biometric and IH Study of Emerging Problems	543	91
28.	Exposure Assessment of Workers Exposed to Acrylonitrile	545	91
29.	Testicular Cancer Screening in Leather Finishers	548	91
30.	Soft Tissue Sarcoma Validation Study	552	91
31.	Beryllium Case Control Study	553	91
32.	Worker Notification	554	92

DIVISION OF SURVEILLANCE, HAZARD EVALUATION, AND FIELD STUDIES (DSHEFS)

		CAN	PAGE
33.	Multiple Cause of Death	555	92
34.	Feasibility Assessments for New Topics	556	92
35.	Ethylene Oxide Mortality Study	557	92
36.	Mortality Study of Chemical Plants in Kanawha Valley, West Virginia	560	92
37.	Genotoxic Effects of Formaldehyde Exp. of Mortuary Science Students	569	92
38.	Investigation of Workers Exposed to MBOCA	572	93
39.	Evaluation of Radon/Radon Progeny Exposures to Radon Mitigators	573	93
40.	Computerization of IHS/IWSB Files	574	93
41.	Lung Cancer Mortality Among Black Workers	575	93
42.	Cancer Screening in Farmers	577	93
43.	Support of EPA'S Environmental Epidemiologic Program	607	93
44.	Job/Exposure Matrix	637	93
45.	Access to NOHS Database - Profile Development	662	94
46.	Tradename Ingredients - National Occupational Exposure Survey (NOES)	663	94
47.	Industrial Hygiene Air Sampling Survey EPA Superfund Sites	664	94
48.	Drake Registry and Screening Project	894	94

DIVISION OF SURVEILLANCE, HAZARD EVALUATION, AND FIELD STUDIES (DSHEFS)

SEVERE OCCUPATIONAL TRAUMATIC INJURIES

		CAN	PAGE
49.	Carpal Tunnel Study	507	96
50.	Survey Instrument Design; Hazard Questionnaire	579	97

OCCUPATIONAL CARDIOVASCULAR DISEASES

51.	Mortality and IH Study of Bridge and Tunnel Officers Exp. to CO	505	102
52.	Case-Control Mortality Study of Nitroglycerin-Exposed Workers	513	102
53.	Cardiovascular Initiative	538	102
54.	Arrhythmia Among Freon Exposed Workers	582	102
55.	Mortality Surveillance of Occupation and Industry	633	102

ASSISTANCE REQUESTS

56.	Health Hazard Evaluations and Technical Assistance	688	115
57.	Health Hazard Assessment at Superfund Sites	897	115

DISORDERS OF REPRODUCTION

58.	Reproductive Initiative	544	105
59.	IH Exposure Assessments in Selected Industries	547	105
60.	Reproductive Study of Female Video Display Terminal (VDT) Operators	687	105

DIVISION OF SURVEILLANCE, HAZARD EVALUATION, AND FIELD STUDIES (DSHEFS)

NEUROTOXIC DISORDERS

		CAN	PAGE
61.	Methanol Exposures in Transit Vehicles (UMTA)	502	107
62.	National Reporting of Selected Occupational Diseases	514	107
63.	An Assessment of the Effectiveness of OSHA's Lead Standard	515	107
64.	Neurological Sequelae of Acute Pesticide Poisoning	530	107
65.	Study of Methyl Bromide and Sulfuryl Fluoride Applicators	535	107
66.	Dioxin Morbidity and Reproductive Study of U.S. Chemical Workers	849	108

NOISE-INDUCED HEARING LOSS

		CAN	PAGE
67.	State Farm Family Health and Hazard Survey (FFHHS)	549	110
68.	Survey Instrument Design: Health History Examination	559	110
69.	Farm Health Hazard Awareness	563	110

DERMATOLOGICAL CONDITIONS

		CAN	PAGE
70.	Analysis of Health Interview Survey Data	508	111
71.	Identification of New Dermatological Hazards in Agriculture	564	111

ADMINISTRATION

		CAN	PAGE
72.	Technical Management - DSHEFS, (OD)	522	117
73.	Technical Management	680	117

DIVISION OF SURVEILLANCE, HAZARD EVALUATION, AND FIELD STUDIES (DSHEFS)

OTHER

		CAN	PAGE
74.	Construction Trades - Mortality Studies	578	121
75.	Occupational Mortality Surveillance Validation	639	121
76.	Comparative Occupational Mortality Analysis	640	121

DIVISION OF SAFETY RESEARCH (DSR)

OCCUPATIONAL LUNG DISEASES

		CAN	PAGE
1.	Injury Prevention Research Branch Management	785	76
2.	Simulated Workplace Protection Factors	786	76
3.	Physiological Responses to the Wearing of Protective Equipment	812	77
4.	Organic Vapor Challenge to Replace Carbon Tetrachloride	828	77
5.	"Use Test" for SCBA Performance Evaluation	829	77
6.	Workplace Protection Factor (WPF) Study	832	77
7.	Filter Loading Effects with a "Worst Case" DOP Aerosol	835	77
8.	Respirator Program Protection Factor (PPF) Field Feasibility Study	836	77
9.	Projected Respirator WPF Values	837	78
10.	Promulgation of 42 CFR 84	839	78
11.	Evaluation, Certification, and Coordination Actvities	852	78
12.	Air Purifying Respirator Testing	853	78
13.	Atmosphere Supplied Respirator Testing	854	78
14.	Coal Mine Dust Personal Sampler Unit	855	78
15.	Quality Assurance Documentation Control	857	79
16.	Operations/Procedure Revision to Implement New Regulations	862	79
17.	Laboratory Modification Needed for Implementation of New Regulations	863	79

DIVISION OF SAFETY RESEARCH (DSR)

		CAN	PAGE
MUSCULOSKELETAL INJURIES			
18.	NIOSH Atlas of Low Back Tests/Measures: Clinical Trials	815	83
19.	Ergonomic Technical Assistance/Research Identification	822	83
20.	Health Care Industry - Low Back Epidemiologic Study	838	84
21.	Low Back Injury Control and Rehab. Strategies for the Federal Worker	875	84
OCCUPATIONAL CANCERS			
22.	Percutaneous Absorption to Evaluate the Standard CPC Permeation Method	880	94
SEVERE OCCUPATIONAL TRAUMATIC INJURIES			
23.	Dissemination	693	97
24.	Local Area Network Development	694	97
25.	Safety in Hazardous Materials Incidents	803	97
26.	Occupational Fatality Injury Surveillance	805	97
27.	Fatal Accident Circumstances and Epidemiology-Technical Assistance	807	97
28.	Grain Handling Injury and Fatality Prevention	808	98
29.	Development of a Workplace Homicide Prevention Strategy	809	98
30.	Rollover Protection for Agricultural Tractors	810	98
31.	Reducing the Risk of Falls Through Roof Openings and Skylights	813	98

DIVISION OF SAFETY RESEARCH (DSR)

		CAN	PAGE
32.	Reducing Falls from Large Off-Road Construction Vehicles	814	98
33.	Failure Analysis of Suspended Scaffold Hoisting Device	816	98
34.	Machine Safety Technical Assistance/ Research Identification	819	99
35.	Quantific of Risk Factors for Falls from Buildings Under Construction	825	99
36.	Occupational Traumatic Injury Surveillance of Farmers	827	99
37.	Development of New Methods for Occupational Injury Surveillance	834	99
38.	Injury Surveillance Branch Management	847	99
39.	State-Based Fatality Surveillance Using the FACE Model	870	99
40.	Development of Surveillance Methods for Occup Motor Vehicle Injuries	874	100
41.	U.S. Farm Family Health and Hazard Survey - Injury Surveillance	877	100
42.	Study of Lineman-Related Fatalities and Injuries	878	100
43.	Agricultural Health Promotion System	883	100
44.	State Model Construction Safety and Health Program	884	100
45.	Surveillance of Site Specific Construction Safety and Health Program	885	100
46.	Industry Specific Injury Reporting System	887	101

DIVISION OF SAFETY RESEARCH (DSR)

		CAN	PAGE
NEUROTOXIC DISORDERS			
47.	Evaluate Field CPC Permeation Method for Furniture Stripping Industry	833	108
DERMATOLOGICAL CONDITIONS			
48.	Safety Components of Small Business Initiative	804	111
49.	Characterization of Holes in Gloves	886	112
50.	Urban Mass Trans. Admin./NIOSH IAG on Methanol Fuel	890	112
OTHER			
51.	Safety Division Management	802	121

DIVISION OF STANDARDS DEVELOPMENT AND TECHNOLOGY TRANSFER (DSDTT)

		CAN	PAGE
OCCUPATIONAL LUNG DISEASES			
1.	Man-Made Mineral Fibers Position Paper	088	74
2.	Acrylamide-Current Intelligence Bulletin (CIB)	089	74
3.	Health Safety Hazards Among Cosmetologists Alert	109	74
4.	Exposure to Air Contaminants During Laser Surgery Alert	110	75
5.	Surface Coal Miners Criteria Document	136	75
MUSCULOSKELETAL INJURIES			
6.	Carpet Layers Knee Trauma Alert	107	82
7.	Cumulative Trauma Disorders Position Paper	138	82
OCCUPATIONAL CANCERS			
8.	Quantitative Risk Assessment	085	88
9.	Joint NIOH/NIOSH Acrylamide Basis for a Recommended Standard	117	88
10.	Acetaldehyde/Propanedial-Current Intelligence Bulletin (CIB)	127	88
11.	Rubber Products Manufacturing Position Paper	139	89
12.	Asphalt Position Paper	144	89

DIVISION OF STANDARDS DEVELOPMENT AND TECHNOLOGY TRANSFER (DSDTT)

		CAN	PAGE
SEVERE OCCUPATIONAL TRAUMATIC DISORDERS			
13.	Feasibility Evaluations and Strategies for Hazard Surveillance	093	96
14.	Explosions/Flammable Liquids Alert	108	96
15.	Occupationally Related Homicides Alert	112	96
16.	Locking and Tagging of Energy Sources Alert	114	96
17.	Confined Spaces Position Paper	146	96
ASSISTANCE REQUESTS			
18.	800 Telephone Information Service	149	115
DISORDERS OF REPRODUCTION			
19.	Glycol Ethers Criteria Document	132	104
NOISE-INDUCED HEARING LOSS			
20.	Occupational Noise Exposure Position Paper	134	109
DERMATOLOGICAL CONDITIONS			
21.	Skin Depigmentation Among Rubber Workers	090	111
22.	Percutaneous Exposure to Organic Solvents Alert	115	111
23.	Cutting Fluids Position Paper	140	111

DIVISION OF STANDARDS DEVELOPMENT AND TECHNOLOGY TRANSFER (DSDTT)

		CAN	PAGE
ADMINISTRATION			
24.	Program Management	082	116
25.	Technology Transfer	084	116
26.	Consultation and Branch Administration: Document Development Branch	094	116
OTHER			
27.	Agricultural Health and Safety Dissemination	073	118
28.	Construction Health and Safety Dissemination	075	118
29.	Technical Inquiries - Construction	076	118
30.	Library-Construction References	079	119
31.	Library Services	083	119
32.	Summary of NIOSH Recommendations for OSH MMWR	086	119
33.	Responses to Regulatory Activities	087	119
34.	Senior Review Activities	092	119
35.	NIOSH Information Systems	095	119
36.	Registry of Toxic Effects of Chemical Substances (RTECS)	096	120
37.	NIOSHTIC	097	120
38.	Publication and Dissemination of NIOSH Publications	098	120
39.	Information Retrieval and Analysis	099	120

DIVISION OF STANDARDS DEVELOPMENT AND TECHNOLOGY TRANSFER (DSDTT)

		CAN	PAGE
40.	International Programme for Chemical Safety (IPCS) Cards	118	120
41.	NIOSH Pocket Guide to Chemical Hazards	120	120
42.	Interim-Recommended Exposure Limits (I-RELS) Guidelines	122	121
43.	Immediately Dangerous to Life or Health (IDLHS) Concentrations	125	121

DIVISION OF TRAINING AND MANPOWER DEVELOPMENT (DTMD)

		CAN	PAGE
OCCUPATIONAL LUNG DISEASES			
1.	Safety and Health for Occupational Professionals (SHOP)	766	79
2.	Indoor Air Quality Initiative	769	79
3.	Agricultural Centers for Research, Education, and Prevention Programs	772	79
4.	Small Business Initiative	774	80
5.	Audio Visual/Graphics Support Services	777	80
6.	Project EPOCH	790	80
MUSCULOSKELETAL INJURIES			
7.	Project Shape	775	84
OCCUPATIONAL CANCERS			
8.	Courses/Modules Development	765	95
9.	Hazardous Substances Training	779	95
SEVERE OCCUPATIONAL TRAUMATIC INJURIES			
10.	Construction Safety and Health Training	762	101
11.	Project Minerva	776	101
12.	Curriculum Development - Video	778	101
DERMATOLOGICAL CONDITIONS			
13.	Grants Administration (GRADS)	764	112

DIVISION OF TRAINING AND MANPOWER DEVELOPMENT (DTMD)

	CAN	PAGE
ADMINISTRATION		
14. Division Administration and Collaborative Networks	763	117